SIEMENS

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Controller Configuration Handbook 667/CC/45950/000

for

ST950 Family of Controllers

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1 INTRODUCTION

1.1 Purpose

This ST950 Family Controller Configuration Document is designed to provide general guidelines to Field Service Controller Configuration Engineers when configuring controllers, at both controller requisition time and at final assembly in depots. Additionally, the document will assist in the manufacture of controllers; including final factory build and subsequent confirmation, prior to delivery to Field Service.

Ongoing development means that some of the delivered items may differ in detail from the photographs included in this handbook.

1.2 Scope

This document describes the configuration of the two base units within the ST950 family of controllers; ST950 mains controller, referred to as the ST900LV and ST950 48V controller referred to as the ST900ELV. The ST950LED controller is sufficiently like the ST900LV controller to allow its configuration to be described in this handbook, in the ST900LV sections. Where necessary the configuration particular to the ST900LED is detailed.

The configuration of export controllers is not detailed by this document. The ordering and configuration of Cuckoo unit is not detailed in this document.

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1.3 Related Documentation

Document Number	Document Title
667/LM/55000/000	Controller Ordering Form
667/HE/46950/000	Installation, Commissioning and Maintenance Handbook for the ST950 Controller
667/HE/45950/000	Installation, Commissioning and Maintenance Handbook for the ST950ELV Controller
667/HH/46000/000	ST950 Controller Handset Handbook
667/RE/29050/000	Siemens OID Elexon Codes
667/HB/47200/000	WiMag Vehicle Detection System General Handbook
667/GA/27087/000	Equipment Mounting Frame Assembly
667/DZ/30600/000	Gemini Family Tree
667/DZ/52250/ETC	Stratos Outstation Family Tree
667/GA/27006/000	Audible Supply Kit
667/GA/20292/008	24VAC 160VA Supply
667/GA/27067/000	Additional Panel Assembly
667/HB/46000/001	ST950 Facilities Handbook
667/GA/27006/000	Audible Supply kit

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1.4 Pre-Requisites for Field Service Operative

1.4.1 Qualifications

Only skilled or instructed personnel with relevant technical knowledge and experience, who are also familiar with the safety procedures required when dealing with modern electrical/electronic equipment, are to be allowed to use and/or work on the equipment. All work shall be performed in accordance with the Electricity at Work Regulations 1989 or the relevant local, state and government regulations.

Any personnel working on an ST950 Controller should have completed the following training courses:

- HA Sector Scheme Sector 8 Modules 5XX
- M609 – Junction Traffic Controller Maintenance for ST950 ELV, and/or
- M609 – Junction Traffic Controller Maintenance for ST950 LV
- M703 – IC4 Configuration

Training requirements for non UK users may be different.

1.4.2 Required Tools

In addition to a standard Engineer's tool kit, the following tools are required when carrying out any work on the ST900 Controller:

Description	Part Number
Netbook kit	667/1/32380/000
USB cable - standard A Plug to B Plug	Generic
T-bar key	667/2/20234/000
S-18 key – Main Cabinet or	4/MC 289
Serial handset Techterm, or	667/4/13296/001
Old Oyster handset, or	667/4/13296/000
Larger Screened Oyster handset	667/4/13296/002
Manual Panel key Type 900	667/4/13651/000

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1.5 Abbreviations and Definitions

Abbreviation	Definition
AC	Alternating Current
CLF	Cableless Linking Facility
CLS	Central Light Source
CPU	Central Processing Unit
DC	Direct Current
DFM	Detector Fault Monitor
ELV	Extra Low Voltage
FT	Fixed Time
GSPI	General Serial Peripheral Interface
GPS	Global Positioning System
HPU	High Power Unit (for ELV Controllers)
I/O	Input/Output
IC4	Intersection Configurator version 4 (UK controller configuration application)
IRM	Integral Remote Monitoring
LED	Light Emitting Diode
LMF	Lamp Monitor Facility
LPU	Logic Power Unit
LRT	Light Rail Transit
LSLS	Lamp Switch Low-Voltage Serial
LV	Low Voltage (Mains)
mA	milliamps
MDU	Mains Distribution Unit (for Mains Controllers; not ELV)
MOVA	Microprocessor Optimised Vehicle Actuation
ms	milliseconds
MTCS	Master Time Clock System
NTP	Network Time Protocol
OMU	Outstation Monitor Unit
OTU	Outstation Transmission Unit
PCB	Printed Circuit Board
RAM	Random Access Memory
RFL	Reset Fault Log (Handset Command)
RLM	Red Lamp Monitoring

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rms	Root Mean Square
ROW	Right Of Way
SDE	Speed Discrimination Equipment
SDE/SA	Speed Discrimination Equipment / Speed Assessment
SVD	Selective Vehicle Detector
UTC	Urban Traffic Control
VA	Vehicle Actuated
wrt	With Respect To
IDB	Intelligent Detector Backplane

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2 ST950 FAMILY OF CONTROLLERS SYSTEM OVERVIEW

The Siemens ST950 Controller family is the latest in a long line of highly integrated traffic controllers.

The ST950 family of controllers can be supplied either in a single-door outer case with a 6U logic rack and equipment mounting frame or as a free-standing logic rack housing the power supply, CPU Card and Lamp Switch cards.

The main features of the ST950 family are:

- Conforms to the UK Highways Agency specification TR2500
- 32 phases, 32 stages.
- 8 streams.
- 8 maximum green sets.
- 8 hurry calls which are in priority order.
- 8 uni-directional detector loop units.
- Multi-mode operation with stage ripple change facility for improved intersection capacity.
- Fully integrated Light Rapid Transport (LRT) mode for use at Tram / Road intersections.
- Fully configurable lamp sequences for worldwide application.
- Fully integral and configurable lamp monitoring of both incandescent and LED signals.
- Flexible part-time and start-up modes, allowing any stream to be sent in and out of part-time mode without affecting any others.
- Cableless linking (Plan) facility with sophisticated plan timetables and 32 plan groups.
- Event timetable which supports actions based on 32 independent events with easy programming.
- Time system with full date details – automatically time synchronised to central system where the controller linked to Siemens UTMC central system.
- Date stamped rolling log providing detailed history of events and faults, coupled with improved presentation to aid recognition of entries.
- Uncomplicated web browser user interface capable of multi-language support
- Support for up to 240 I/O lines via I/O cards and Intelligent Detector Backplanes
- RS232 and USB interfaces for handset, modem and GPS

The essential differences between the ST900 and the new ST950 family of controllers are:

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- New CPU Card providing additional functionality and interfaces
- Improved user interfaces including web pages
- I/O card firmware can be updated in-situ.
- Support for existing ST900 equipment such as Gemini and Gemini^2
- Integral MOVA7 and OTU functionality options
- Removable Storage device contains junction specific data allowing fast repair by card replacement and storage device transfer
- Extended features licensed through encrypted license card
- Integrated Ethernet interface
- USB interfaces for handset, memory devices, and license card readers
- The ST800/ST900 Extended System Bus interface is no longer provided on the ST950 which means that the IRM, OTU Card, SDE/SA Card no longer supported

3 ST950 HARDWARE ALLOCATIONS AND CONNECTIVITY

3.1 ST950 Outercase Selections

With reference to **Table 1** the ST950 is supplied in a single door large Outercase. The main functional cards are house in a Rack Assembly which is mounted in a swing frame. The Rack Assembly forms the base functional unit for the entire controller and can be ordered as a standalone unit, known as a Cuckoo Unit. Cuckoo Units may be fitted to a number of different third part cabinets. More often the Rack Assembly will form part of a fully functional controller. With knowledge of the load, phases, stages, and lanterns to be served, the following notes will allow configuration engineers to populate a ST950 Low Voltage Controller with the appropriate components. Note the ST950 low voltage controller may be referred to as the ST950LV in this document.

It will be recognised that certain components within the ST950 low voltage controller are standard items, required to make a controller a basic functioning unit and service additional configurable components. When a controller is ordered it will contain these standard items. A list of these standard items is set out below.

Please note, to assist configuration engineers in their choice of Outercase the relationship between Outercase, MDU and Lamp Switch Cards in the ST950LV is detailed in section 3.2, ST950 Rack Assembly.

Standard Items Included in controller cabinet, chosen from **Table 1**

- Mains Transformer
- Master Switch Assembly
- Termination Panel
- One Lamp Switch Card
- Mains Distribution Unit
- 19"Swing Frame with Rack Assembly
- Manual Panel

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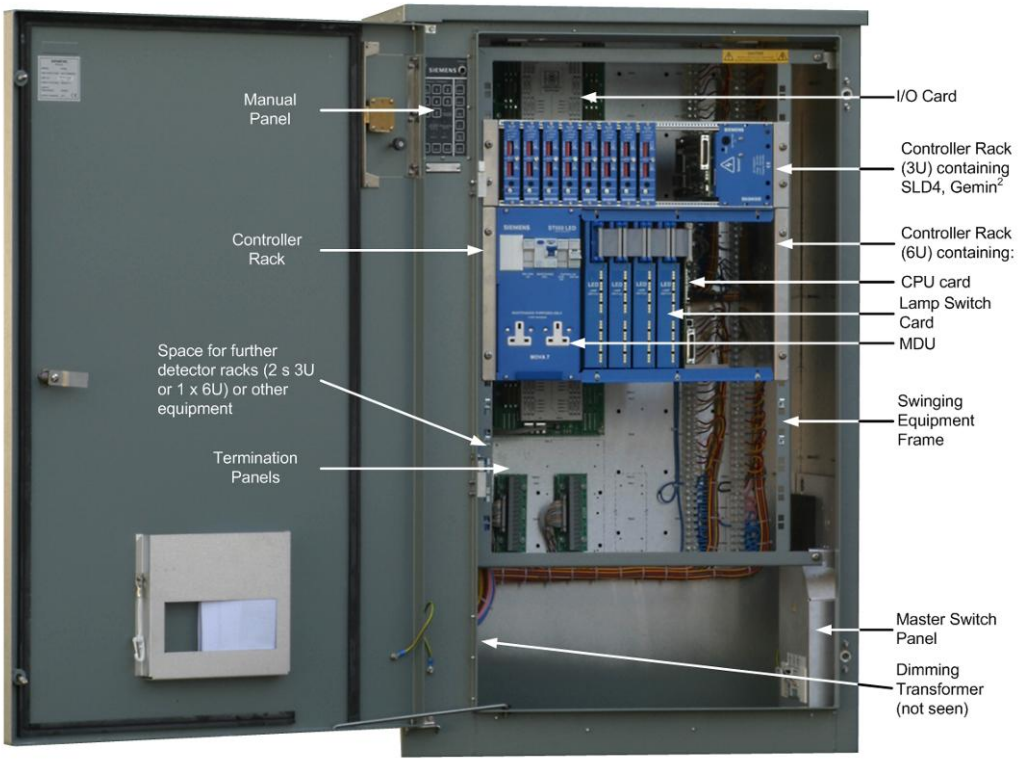
Table 1 – ST950 Outercase Selection

Part Number	Description
667/1/46950/010	ST950 Cabinet UK 1.5KVA 8ph wired 8ph - Grey
667/1/46950/011	ST900 Cabinet UK 1.5KVA 8ph wired 8ph - Black
667/1/46950/018	ST950 Cabinet UK 0.5KVA 8ph wired - Grey
667/1/46950/019	ST950 Cabinet UK LED 0.5KVA 8ph wired - Black
667/1/46950/020	ST950 Cabinet UK 3.0KVA 24ph wired - Grey
667/1/46950/021	ST950 Cabinet UK 3.0KVA 24ph - Black
667/1/46950/028	ST950 Cabinet UK LED 0.5KVA 24ph wired - Grey
667/1/46950/029	ST950 Cabinet LED 0.5KVA 24ph wired - Black

Figure 1 - ST950 Controller overview



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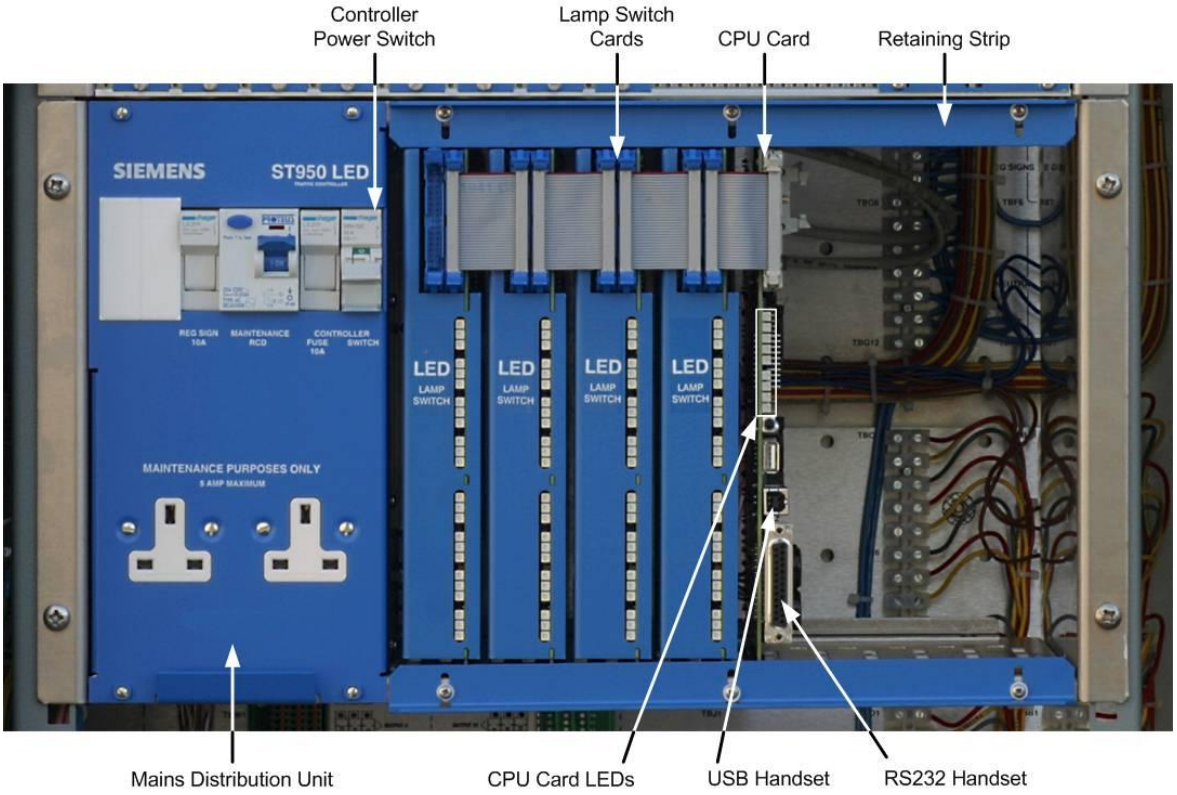
3.2 Rack Assembly

3.2.1 Rack Assembly Mounting Position

The ST950 Outercase is configured with a 19 inch swing frame, to which the ST950 Rack Assembly is mounted. The Rack Assembly will be positioned in the Swing Frame as shown in **Figure 1**. Information on exact positioning of the ST950 Rack Assembly should be sought from manufacturing drawing detailed in the related document section of this handbook. The ST950 Rack Assembly should not be ordered separately as it is included in the Outercase, ordered from **Table 1**. The components mounted within the ST950 Rack Assembly are shown in **Figure 2**.

Figure 2 - ST950 Rack Assembly

Please Note, **Figure 2** shows the ST950 Rack Assembly with ST950LED Components. The ST950LV Rack Assembly components appear in the same positions.



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3.2.2 Mains Distribution Unit

The Mains Distribution Unit should **not** be ordered separately as it is included in the Rack Assembly, which in turn is part of the Outercase, selected from **Table 1**. Configuration Engineers should calculate the load anticipated and select the appropriate Outercase. Please refer to the ST950 General Handbook for information on calculating controller loads. The necessary Mains Distribution Unit will be fitted to the controller to accommodate the required load. All variants of the Mains Distribution Unit contain the Dim/Bright, Relay A, Relay B and SSR Relay. It also provides the Logic Power Supply, which supplies +5VDC and +24VDC to the cards in the ST950 Rack Assembly. Incorporated onto the Mains Distribution unit are two 5A power supply sockets, for use with test equipment. A 10 Amp regulatory fuse is provided at the Mains Distribution Unit to provide a separate power supply for sign equipment.

ST950LED
Configuration Engineers should note that the Mains Distribution Unit fitted to the ST950LED is a modified version of the Mains Distribution Unit fitted to the ST950 Low Voltage Controller.

3.2.3 Lamp Switch Cards

The Lamp Switch Cards provide the necessary phase output drive for the signal lanterns. Please refer to **Figure 2**, which shows typical positioning of Lamp Switch Cards. Termination strips are mounted to the termination panel, at the rear of the controller, to provide the necessary connections, so the phase outputs can be distributed to street equipment. Each Lamp Switch Card is capable of driving 8 distinct phases. The number of Lamp Switch cards required in the Rack Assembly will be determined by junction configuration and load. Please consult the ST950 General handbook for advice on calculation loads. Correlation between the actual hardware mounted to a controller and the Processor's knowledge of equipment mounted in a controller is determined in the Configuration Programming Tool IC4. Configuration Engineers should be fully trained in the use of IC4 in order to configure the ST950 Controller.

The maximum number of Lamp Switch Cards that can be fitted to the ST950 Controller is four, providing a potential to drive 32 separate phase outputs. Controller will be wired, at manufacture, to accommodate the number of Lamp Switch Cards indicated in the table 1 description. The 8 phase wired controllers chose from **Table 1** will be configured with one Lamp Switch Card**.** The 24 phase wired controllers chose from **Table 1** will be configured with three Lamp Switch Cards**.** Additional Lamp Switch Cards and associated wiring should be specified. Please refer to the part listing for these items. Information on routing of looms and termination of connections should be sought from manufacturing diagrams. With reference to **Figure 2**, Lamps Switch Cards occupy specified positions in the Rack Assembly. The selection of the Outercase from **Table 1**, in addition to determining the wiring, number of Lamp Switch Cards and the amount of current available to be drawn by street equipment also determines the type of Lamp Switch Cards fitted to a controller. Lamp Switch Cards fitted to the LED controller are specifically designed to operate in conjunction with and monitor LED CLS NLM signal heads. Controllers without the LED designation operate and monitor LED signal heads equipped with LMF modules. Further information on controller selection should be sought from the ST950 Controller General Handbook.

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3.2.4 ST950 CPU Card

The ST950 CPU Card will be mounted to a designated position in the Rack Assembly, as shown in **Figure 2**. The CPU Card is holds the controller configuration and performs the function of configuration, control and management. The main external data interfaces of the CPU Card are:

- Interface to Lamp Switch Cards
- Serial Interfaces (GSPI) to IO Cards and Intelligent Detector Backplanes
- Manual Panel
- RS232 interface to handset, Gemini^2 or Stratos Outstation
- USB interfaces
- Ethernet Interface

3.2.5 CPU I/O Card

The ST950 Controller can be equipped with additional Input/Output cards, remote from the CPU card. However, the ST950 can also be equipped with a CPU I/O Card, mounted in a daughter board arrangement on the CPU Card. Please refer to **Figure 3**.

Figure 3 – CPU I/O Card

The CPU Card I/O is **not** supplied in the Outercase chosen from **Table 1**, it is ONLY supplied with specific Cuckoo kits as an option. Ultimately, all I/O signals are returned to / derived from the ST950 Processor. The ST950 CPU Card, CPU I/O card, and other components described later in this handbook (I/O cards on the termination panel and Intelligent back planes) communicate via a GSPI serial interface. The serial communication is carried out over Cat5e cable. The serial Link relies on addressing techniques to ensure that the appropriate information is delivered to the correct component. The order of the serial link connections does not influence the operation of the serial link. However, for purposes of consistency the order of connection set out in **Table 2** should be used. When a component is not fitted the serial link continued onto the next component in the sequence.

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Table 2 – Serial Link Connections

Component	Input	Output
CPU card	Serial link derived from CPU card	RJ45 Serial Link Output Socket
CPU I/O Card	RJ45 Serial Link Input	RJ45 Serial Link Output
Termination Panel Upper I/O Card	RJ45 Serial Link Input	RJ45 Serial Link Output
Termination Panel Lower I/O Card	RJ45 Serial Link Input	RJ45 Serial Link Output
First Intelligent Detector Backplane	RJ45 Serial Link Input	RJ45 Serial Link Output
Second Intelligent Detector Backplane	RJ45 Serial Link Input	RJ45 Serial Link Output

3.3 Termination Panel

With reference to **Figure 4** the mounting of both standard equipment and optional equipment to a Controller is achieved using Termination Panels. One Termination Panel is fitted to the 1.5KVA 8ph wired version of the ST950 and two are fitted to the 3.0KVA 24ph wired version of the ST950 controller. The Termination Panels do **not** need to be ordered separately as they are contained within the Outercase, selected from **Table 1**. When upgrading a controller from 1.5KVA to 3.0KVA Configuration Engineers should consult the parts listing for additional Termination Panels. Termination panels will be positioned centrally at the rear of the ST950 cabinet, one above the other when two panels are fitted. Certain large items have designated positions within the controller, others are subject to optimisation. For this reason some items may vary slightly in position, from one controller to another. Termination panels have stencilled graphics to assist in the positioning of equipment.

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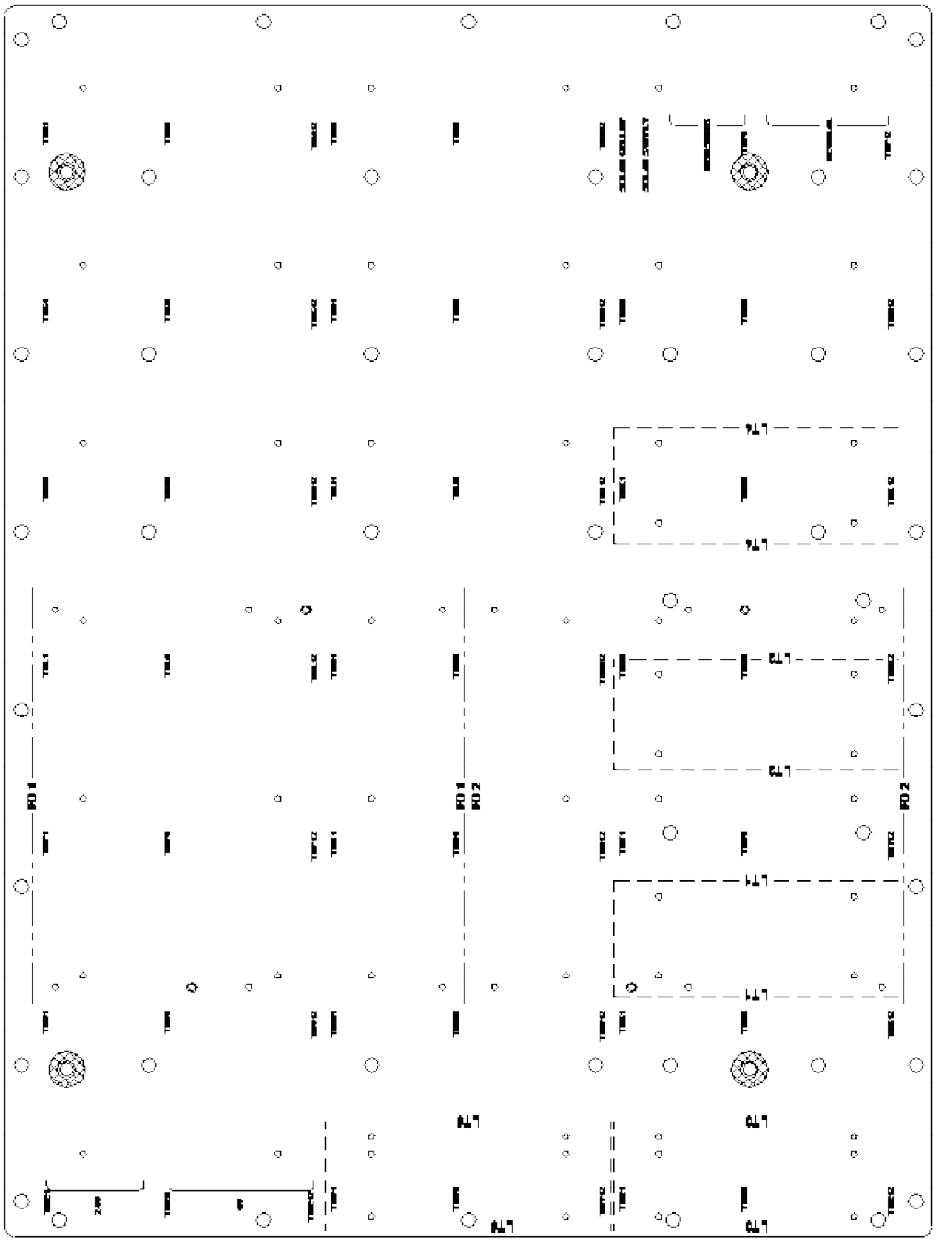
Figure 4 – Rotated view of the ST950 Termination Panel



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3.4 Master Switch Assembly

The Master Switch Assembly forms part of the Outercase, chosen from **Table 1** and therefore should **not** be ordered separately. As shown in **Figure 2** the Master Switch Assembly occupies a position in the bottom right hand corner of the ST950 Controller.

With reference to **Figure 5**, the mains supply voltage is applied to the main ON/OFF 63A Switch, within the Master Switch Assembly, for onward supply to the ST950 Traffic Controller.

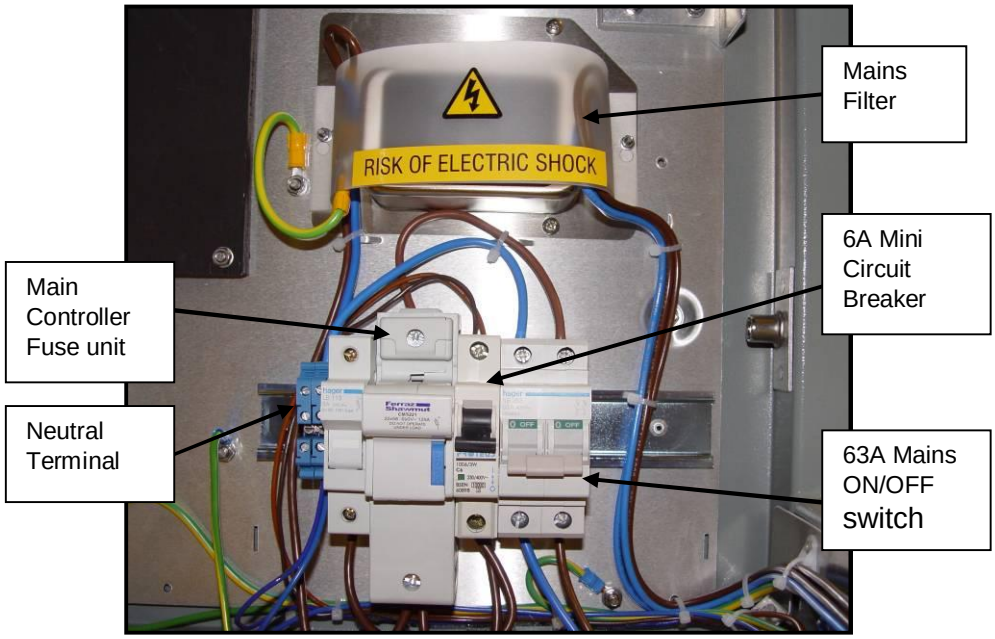
The live connection is taken from the main ON/OFF 63A Switch and applied to a 45A main controller fuse unit; the neutral is applied to a neutral terminal. The output from the fuse unit is applied to a mains filter, as shown in **Figure 5**, for onward distribution to the Mains Distribution Unit.

The **ST950 LED** has a modified Master switch assembly with a Master fuse rating of 20A this must not be replaced by a fuse of larger rating.

An additional output is taken from the main fuse unit and supplied a 6A Mini Circuit Breakers. This additional mini circuit breaker provides a controller working supply, typically utilised to provide power to an OTU.

The neutral connection for the mains filter unit is taken from the neutral terminal, also detailed in **Figure 5**.

Figure 5 – Master Switch Assembly



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3.5 Dimming Transformer

The dimming transformer for the ST950 is so called because it provides the necessary drive to the MDU for onward delivery to the Lamp Switch cards. The appropriate transformer will be contained with the Outercase, specified in **Table 1** and should **not** be ordered separately. Full details on the procedure for load calculation should be sought form the ST950 General Handbook.

On those occasions when a 1.5KVA ST950 Outercase is specified the appropriate transformer will be configured. Similarly, when a 3.0KVA 24ph wired Outercase is specified the necessary dimming transformer will be configured to the controller.

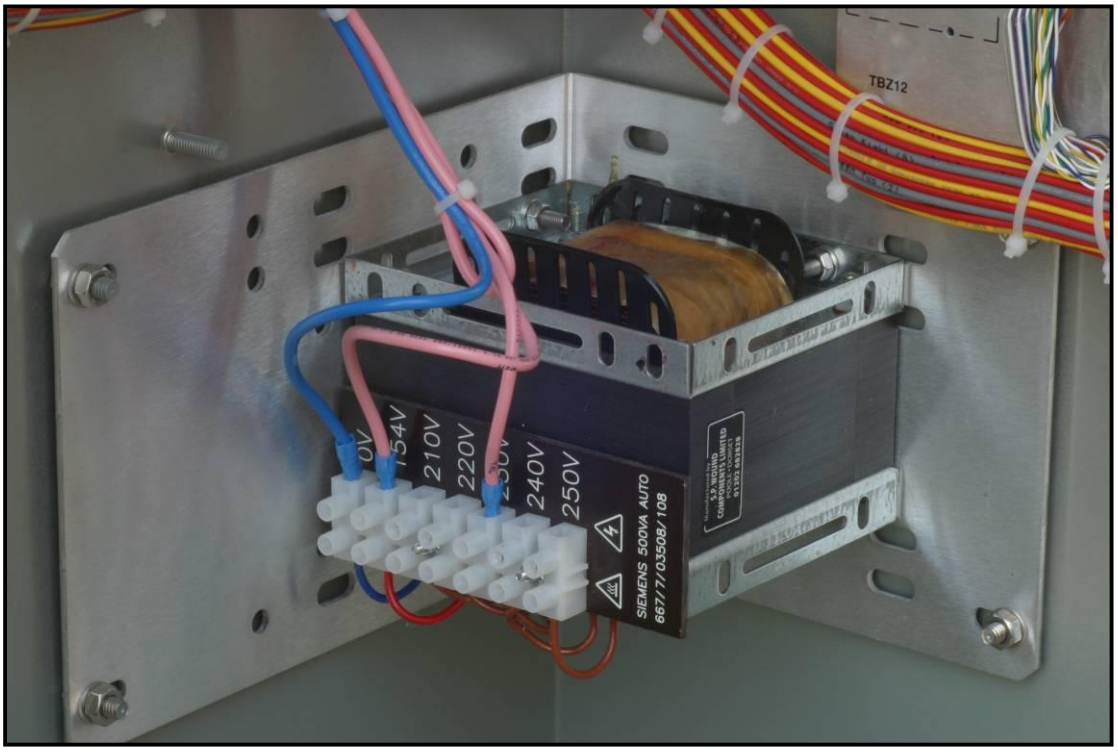
ST950LED

Note, the ST950 LED has a single variant of dimming transformer rated at 500VA

The Dimming Transformers will occupy a position in the bottom left hand corner of the controller**. Figure 6** shows the transformer fitted to the ST950 cabinet.

To accommodate different input voltage to the Dimming Transformer mains input can be applied to the Dimming Transformer at the appropriate terminals. Please refer to the ST950 General Handbook for full information.

Figure 6 – ST950LED Dimming Transformer



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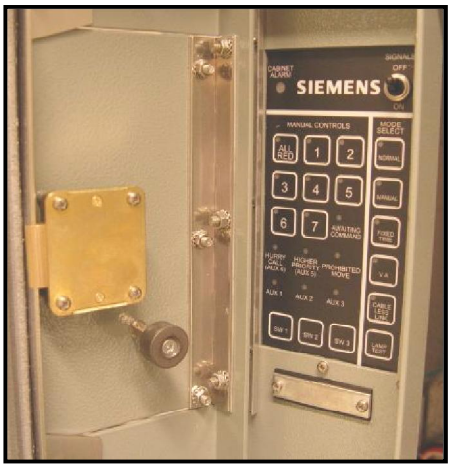
3.6 The Manual Panel

The Manual Panel is contained within a secure compartment in the top left hand corner of the controller cabinet. Access to the manual panel may be gained via the manual panel access door or by opening the controller cabinet main door. The manual panel forms part of the Outercase, chosen from **Table 1**, and therefore should **not** be specified separately. The detector fault monitoring LED indicator is repeated from the manual panel to the outer case by the use of a lens. The lens kit and should be ordered separately, if the unit is required. Please refer to the parts listing for this item

Instruction on the fitting of the DFM Lens kit should be sought from drawing No. 667/CH/27104/000.

The 34 way ribbon cable from manual panel connects into socket PL3 on the CPU Card; marked Manual Panel.

Figure 7 – ST950 Manual Panel



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3.7 Intelligent Detector Backplanes

Intelligent Detector Backplanes do not form part of the base Controller Cabinet and therefore should be specified separately. Each Intelligent Detector accommodates four SDL4 Cards. Notes on the SLD4 Detector Cards are provided later in this document. **Figure 12** provides a listing of required components when selecting the Intelligent Detector Backplanes and accompanying SLD4 cards. Please also refer to the parts list for these items.

With reference to **Figure 8** and drawing 667/GA/27087/000, Intelligent Detector Backplanes and associated SLD4 Detector Cards are fitted into 19" Racks Kits. As the numbers of Intelligent Detector Backplanes increase the number of 19" Racks Kits required will increase. Unless otherwise stated, in a work specification, the first 19" Rack Kit will be fitted to the 19" Swing Frame below the Controller Rack Assembly. The first three Intelligent Detector Backplanes will be fitted to this 19" Rack Kit. If more than three Intelligent Detector Backplanes are required a second 19" Rack kit should be specified, which will be fitted below the first 19" Rack Kit. The Intelligent Detector Backplane 4, 5 and 6 will be fitted to this second 19" Rack kit. For further information on the inter-relationship between Intelligent Detector Backplanes, SDL4 Cards, Processor Card and I/O Cards please consult the ST950 General Handbook. The area above the Rack Assembly in the 19" Swing Frame is designated as the area for fitting a 19" Rack Kit, to mount a Gemini or Stratos Outstation Unit (further information on the Gemini Unit or Stratos Outstation is provided later in this document). With further reference to **Figure 8**, the Gemini or Stratos Outstation will be fitted on the right hand side of a 19" Rack Kit, viewed from the front of the 19" Swing Frame.

Configuration Engineers should note when referencing the cases below that an Infrared communications link provides automatic set-up between SLD4 cards. This link operates horizontally but not vertically. To provide this link between vertically mounted SLD4 cards a link cable should be fitted between Intelligent Detector Backplane on associated horizontal levels. Please refer to parts listing for link cable. Please also refer to **Figure 9** which shows the required link.

Important Note

Configuration Engineers should read the notes in the WiMag section regarding Backplane positioning. Important information on the relationship between SDL4 Cards, the Infrared communication link between SLD4 cards and the restrictions this communication technique has on the positioning of SLD4 Cards is contained in the that section.

Communications between CPU Card and Intelligent Detector Backplanes are carried out via GSPI serial link, using Cat5e cable/RJ45 connector. The GSPI serial link communication protocol relies on addressing techniques to ensure the appropriate information is delivered to the intended component. This means that the order in which the components are connected to the link is not imperative to successful communications. However, to maintain consistence build configuration the sequence of connections set out in **Table 2** should be used.

With reference to **Figure 9**, power is provided to the Intelligent Detector Backplanes from the Detector Power Supply Kit. Additional power can be provided for Intelligent Detector Backplanes, refer to paragraph 3.12.

Loop activation signals are passed to the Intelligent Detector Backplanes from the Loop Terminal Card via PL8. Refer to paragraph 3.10 for information on Loop Termination Cards.

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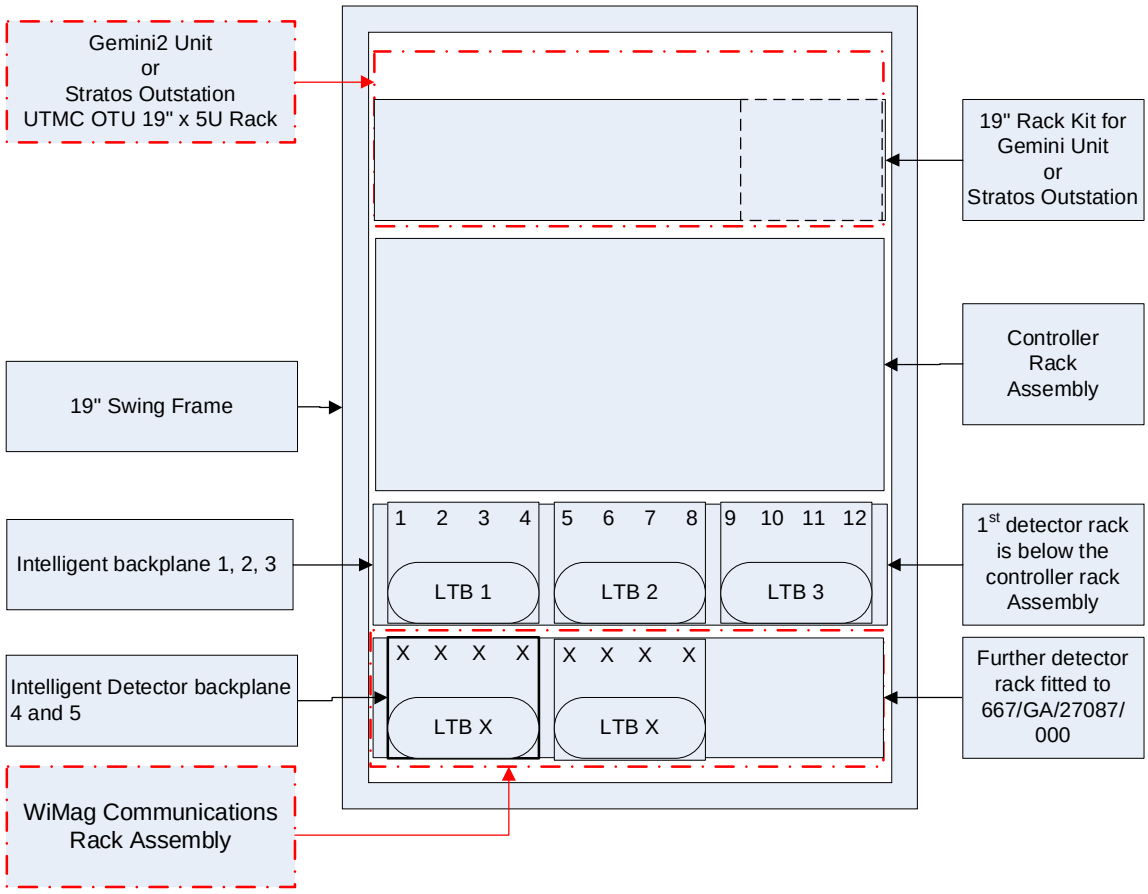
Figure 8 – ST950 – Swing Frame layout



See drawing 667/GA/27087/000

Populate further racks, from left to right **(viewed from front)** in a similar patter

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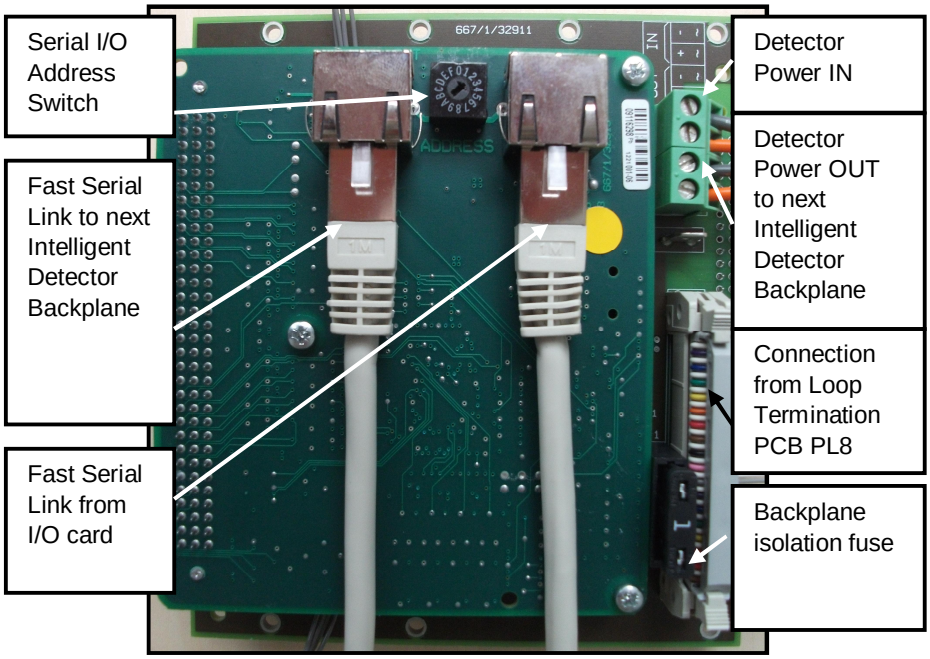
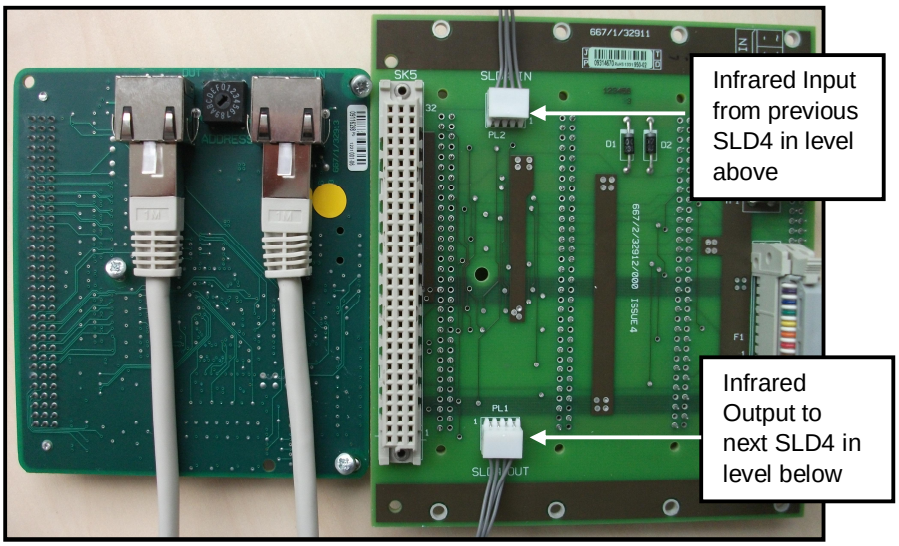
Figure 9 shows the connections of the serial link to the first Intelligent Detector Backplane. The sequence of connection set out in **Table 2** should be followed. The GSPI serial link is connected from the first Intelligent Detector Backplane OUT socket into the second Intelligent Detector Backplane IN socket. This sequence of connections should be followed for connection between first Intelligent Detector Backplanes and the final Intelligent Detector Backplane. Please also note that a separate infrared connection is required for SLD4 automatic set-up. This link operates horizontally and therefore SLD4 cards must be mounted alongside each other to communicate in this fashion. Please refer to **Figure 9** which shows the required connection to continue this infrared link vertically.

Figure 9 – IDB Serial Connection


Serial I/O Address Switch
Fast Serial Link to next Intelligent Detector Backplane
Fast Serial Link from I/O card
Detector Power IN
Detector Power OUT to next Intelligent Detector Backplane
Connection from Loop Termination PCB PL8
Backplane isolation fuse

View Intelligent Detector Backplane with comms PCB removed



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3.8 Single detector backplane

If preferred, Single Detector Backplane may be fitted to the ST900. Single Detector Backplane do not form part of the Outercase, chosen form **Table 1**, and therefore should be specified separately, The optimisation of the Single Detector Backplane follows the same sequence of positioning as that detailed in section 3.7.

Power for the Single Detector Backplanes is obtained from Detector Power Supply Kit, as detailed in paragraph 3.12. Please refer to **Figure 10** and 11 for the Single Detector Backplane connection scheme. Please also refer to the parts listing for this item.

Figure 10 – Single Back Plane wiring positions

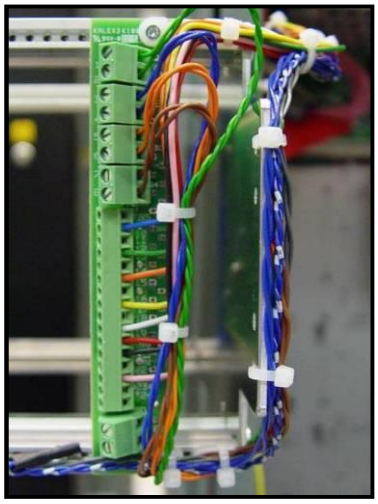
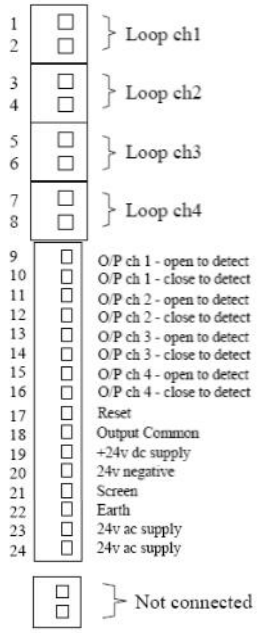


Figure 11 – Single Detector Backplane Connection Scheme



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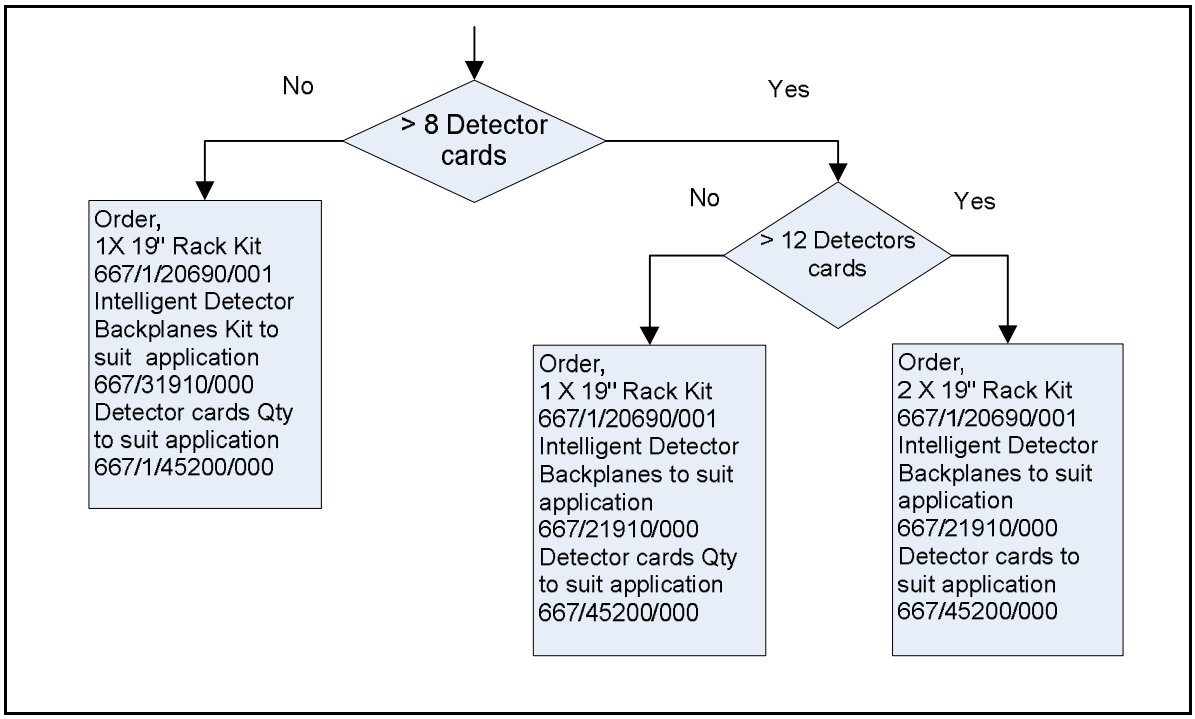
3.9 SLD4 Detector Cards

As detailed in previous section SLD4 detector cards are inserted into Intelligent Detector Backplanes. Each Intelligent Detector Backplane will accommodate four SDL4 Detector Cards. The SDL4 Detector Cards have an infrared facility to communicate with each other; this allows automatic setup. The infrared beam travels horizontally between SLD4 cards and therefore only those SLD4 cards that are mounted alongside each other can utilise this infrared communications technique. Communications between SLD4 Cards mounted vertically, with respect each other must be connected using a link cable. Please refer to the parts listing. Please also refer to **Figure 9** which shows the required connection.

Figure 12 – Ordering Sequence for Detector Back Planes and Detector Cards



Important Note

Configuration Engineers should read the notes in the WiMag section regarding Backplane positioning. Important information on the relationship between SDL4 Cards, the Infrared communication technique between SLD4 cards and the restrictions this communication technique has on the positioning of Detector Cards is contained in the that section.

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3.10 Loop Termination Cards

The Loop Termination cards are contained within the Intelligent Detector Backplane Kits. Please refer to the parts listing. Positions, set aside for the Loop Termination cards and I/O cards, coincide to some degree and this conflict requires that attention be paid to optimisation of these components. **Figure 13** show the positioning of the loop termination cards when one serial I/O cards is fitted. **Figure 14** and 16 detail the sequence of Loop Termination allocation when one, two, three and four I/O cards are fitted.

Figure 13 – Loop Termination I/O Positions

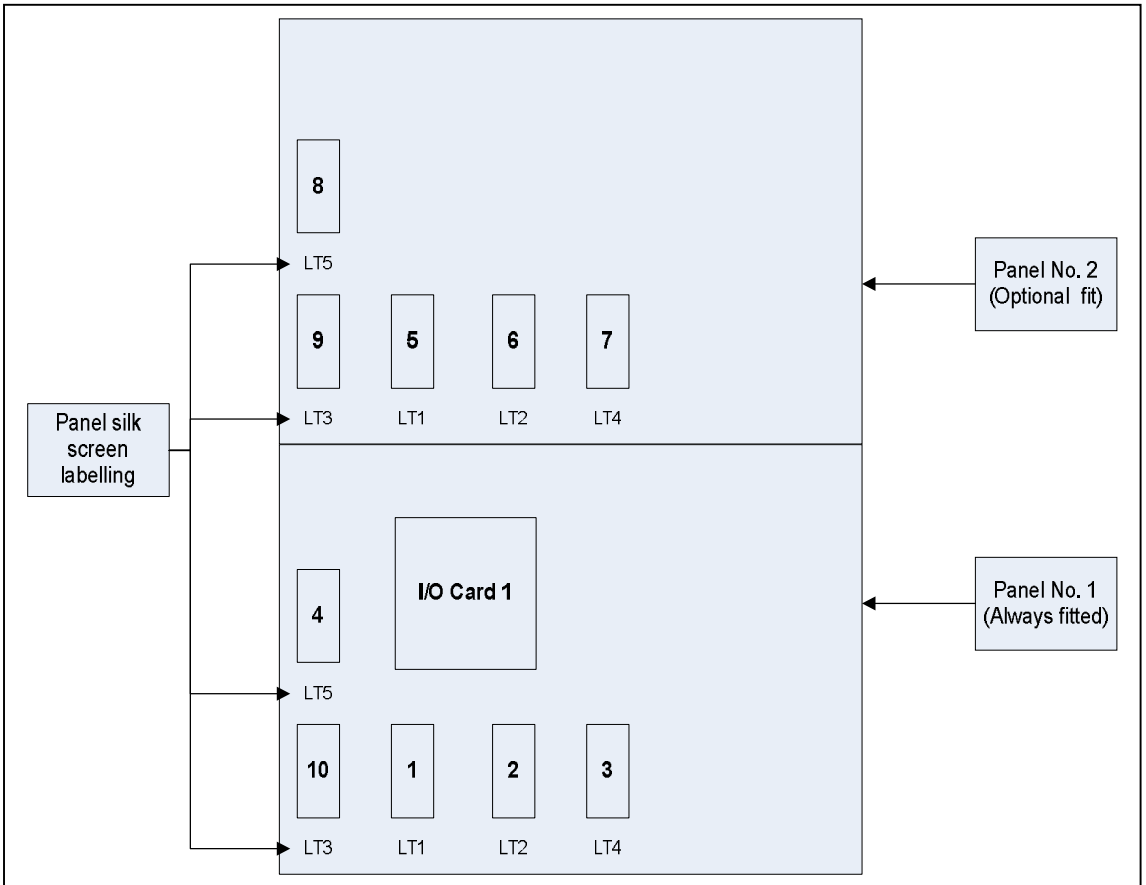

Figure 2 LV Cabinet Loop termination board allocations with one serial I/O PCB fitted

Panels 1 is always fitted
Card positions are silk screened LT 1 etc
Loop Termination Card 1 allocated to Panel 1, position LT1
Loop Termination Card 2 allocated to Panel 1, position LT2

Loop Termination Card 3 allocated to Panel 1, position LT4
Loop Termination Card 4 allocated to Panel 1, position LT5
Loop Termination Card 5 allocated to Panel 2, position LT1
Loop Termination Card 6 allocated to Panel 2, position LT2
Loop Termination Card 7 allocated to Panel 2, position LT4

Loop Termination Card 8 allocated to Panel 2, position LT5
Loop Termination Card 9 allocated to Panel 2, position LT3
Loop Termination Card 10 allocated to Panel 1, position LT3

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Figure 14 – Loop Termination I/O Positions

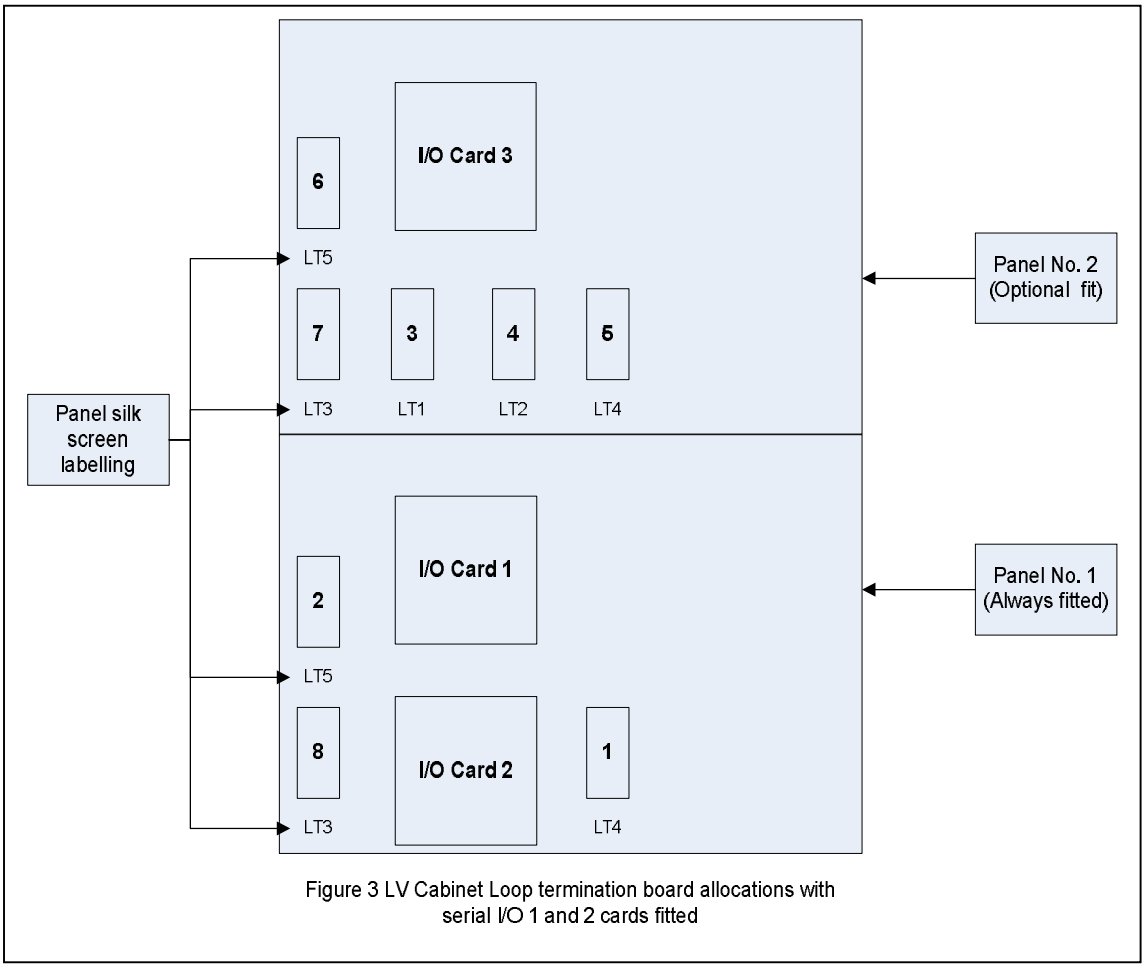

Figure 3 LV Cabinet Loop termination board allocations with serial I/O 1 and 2 cards fitted

Allocation Sequence Rules:

Panels 1 is always fitted

Card positions are silk screened LT 1 etc. With reference to **Figure 14** the Loop Termination Boards Should be allocated in the following order;
Loop Termination Card 1 allocated to Panel 1, position LT4
Loop Termination Card 2 allocated to Panel 1, position LT5
Loop Termination Card 3 allocated to Panel 2, position LT1
Loop Termination Card 4 allocated to Panel 2, position LT2
Loop Termination Card 5 allocated to Panel 2, position LT4
Loop Termination Card 6 allocated to Panel 2, position LT5
Loop Termination Card 7 allocated to Panel 2, position LT3
Loop Termination Card 8 allocated to Panel 1, position LT3
Positions LT1 and LT2 on Panel 1 can NOT be used.

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Figure 15 – Loop Termination I/O Positions

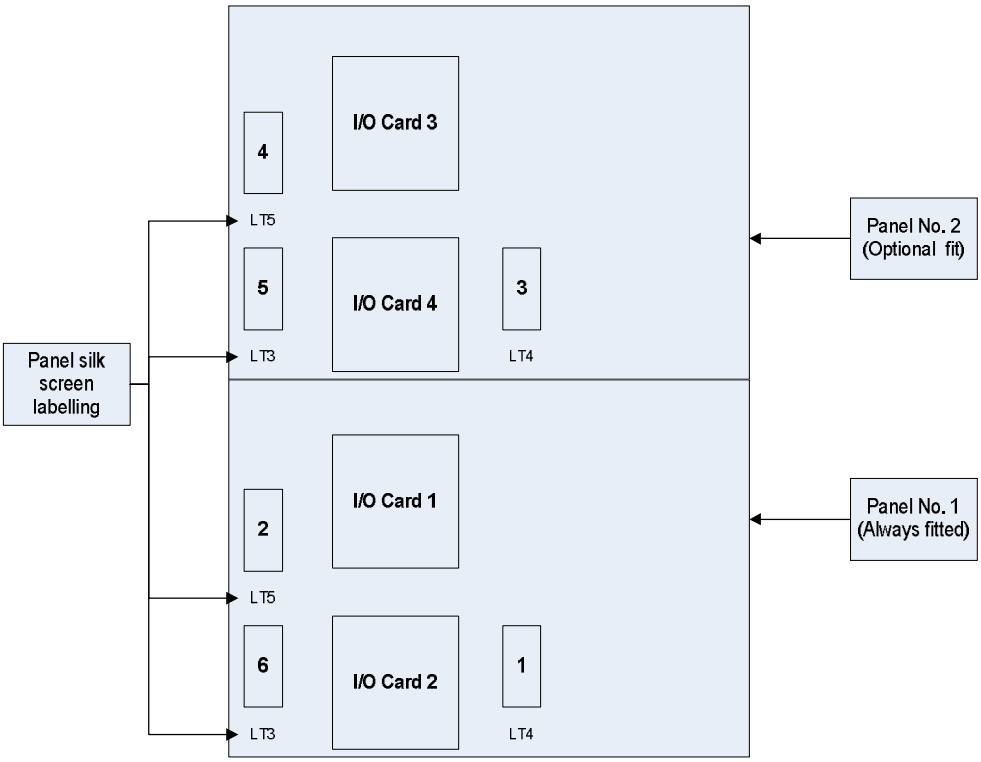

Figure 4 LV Cabinet Loop termination board allocations with serial I/O 1 to 4 cards fitted

Allocation Sequence Rules:

Panels 1 is always fitted
Card positions are silk screened LT 1 etc
Loop Termination Card 1 allocated to Panel 1, position LT4
Loop Termination Card 2 allocated to Panel 1, position LT5
Loop Termination Card 3 allocated to Panel 2, position LT4
Loop Termination Card 4 allocated to Panel 2, position LT5
Loop Termination Card 5 allocated to Panel 2, position LT3
Loop Termination Card 6 allocated to Panel 1, position LT3

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Figure 16 - Flow chart LV Controller I/O and Loop termination PAC Allocation Rules

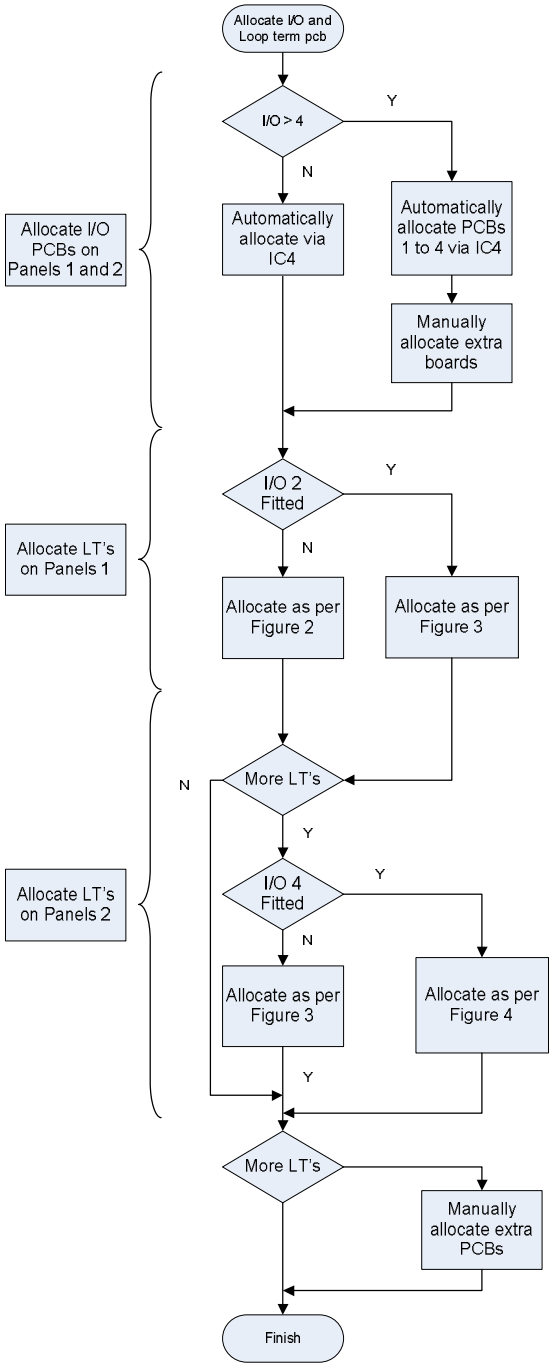

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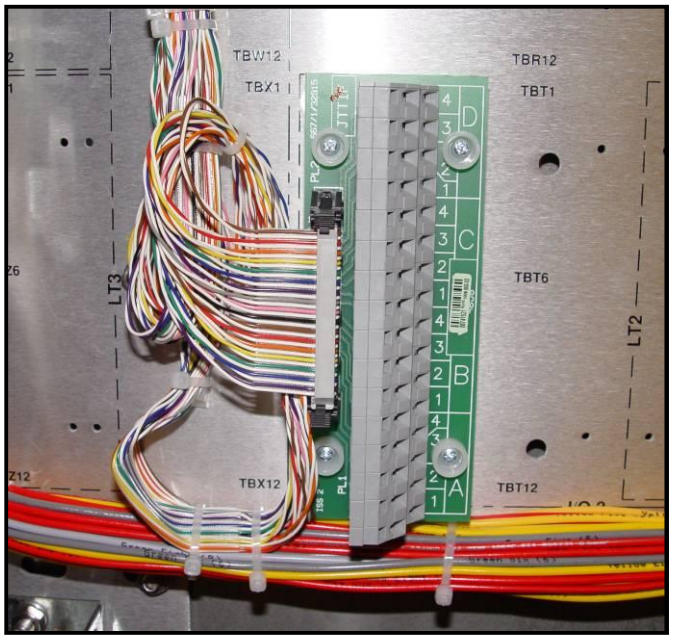
Figure 17 shows a Loop Termination Card. PL2 on the Loop Termination PCB should be connected to the associated Intelligent Detector Backplane.

Figure 17 – Loop Termination Card



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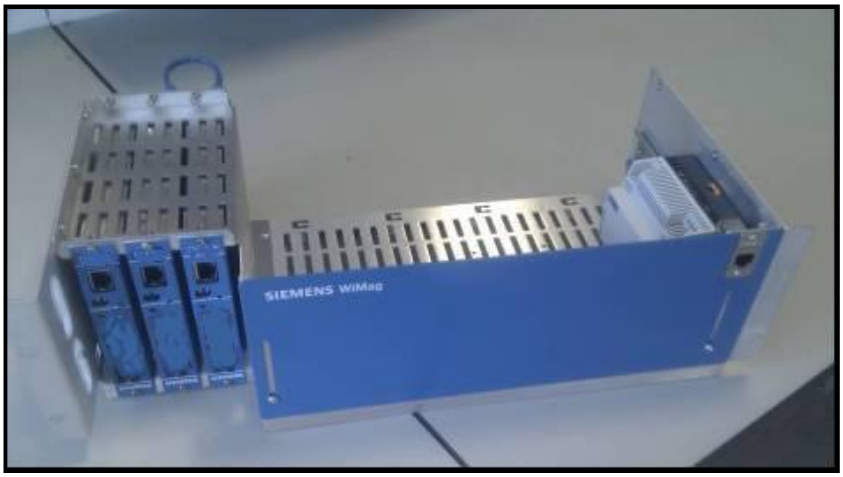
3.11 WiMag

3.11.1 WiMag 3U Rack Kit (19”) System

WiMag is not included in the Outercase ordered from **Table 1** and therefore must be specified separately. Please refer to the parts listing for this item. The following configuration procedure details a basic controller WiMag installation. Full system installation details should be sought from the WiMag Detection System General Handbook, detailed in the related documentation section.
With reference to **Figure 18**, the cabinet mounted equipment required as part of the WiMag installation is mounted to the 19” WiMag Communications Rack Assembly. This unit will be installed below the ST950 Rack Assembly. The WiMag Communications Rack Assembly will hold up to three Standard Interface Cards, servicing 20 WiMag sensors each. Each of the Standard Interface cards plugs into an individual backplane PCB. Sufficient space is available behind the centre section of the WiMag Communications Rack Assembly to house the necessary 4/8 port Power Over Ethernet (POE) Switch. A Power Supply Unit will be installed on the right hand side of the WiMag Communications Rack Assembly. The standard WiMag Communications Rack Assembly is supplied with one Standard Interface Card, and associated backplane. Additional Standard Interface Cards should be ordered at controller configuration time. The appropriate POE unit should also be ordered at controller configuration time.

Figure 18 - WiMag Control Unit



The selected POE device should be installed prior to the installation of the WiMag Communication Rack being installed in the controller. The POE is secured into the WiMag Communications Rack on the DIN rail, as illustrated in **Figure 19**, 20 and 21.

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Figure 19 – POE Unit

Connect a non-POE Ethernet port to the user maintenance Ethernet port using a supplied Ethernet cable.

Figure 20 – POE Unit

Figure 21 – POE Unit

48V DC Power is provided to the Power Over Ethernet switch from the WiMag Communications Rack Power Supply. The Grey wire from the PSU will be connect to the +VE terminal and the white return wire will be connected to the –VE terminal of the POE switch.

Figure 22 – POE Unit

The backplane is used to provide power to the interface card. Backplanes are connected together using Ethernet cable. The first Backplane is connected to the PHS (PL2 or PL4) PCB at the controller's Processor PCB. On those occasions when the Ethernet ports on the PHS PCB occupied an output port on an Intelligent Detector Backplane will be utilised. Please refer to **Figure 23** and 24.

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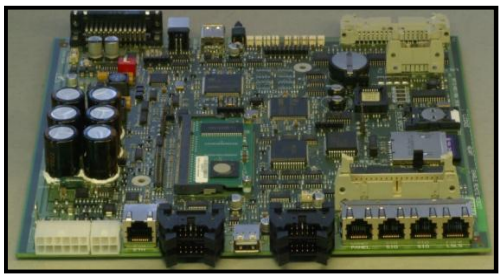
Figure 23 – WiMag Backplane

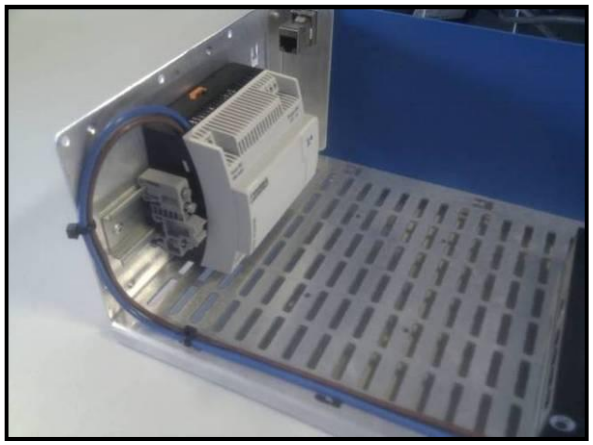
Figure 24 – CPU Board



The Standard Interface Cards are connected from the front Ethernet port to the appropriate ports on the POE switch.

The WiMag Communications Rack Assembly will be provided with unfiltered mains from the controller Master Switch Unit. Live is to be taken from the 6amp auxiliary miniature circuit breaker, marked as 'AUX1 MCB', Neutral from the neutral block and Earth from any main earthing stud.

Figure 25 – WiMag Tray



The instructions above details the basis configuration procedure for the WiMag system into a ST950 Controller The final configuration and commissioning of the Standard Interface outputs and the interface with street installed equipment should be sought from the WiMag Detection System General Handbook.

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3.11.2 WiMag Loop Detector Replacement Card

Under normal circumstances WiMag Detection signals will be processes by components in the WiMag system, detailed in section 3.11.1.
However, to allow the minimum amount of equipment to be installed in a controller the WiMag loop detector replacement card has been developed to provide up to 4 magnetometers.
The WiMag Loop Detector Replacement Card plugs into either an individual detector backplane or a dedicated intelligent Detector Backplane. Configuration Engineers should configure controllers to ensure that the WiMag Loop Detector Replacement Cards are inserted into their own Intelligent Detector Backplane or Single Detector Backplane. This is because the WiMag Loop Detector Replacement Card has particular power requirement that are not compatible with the SLD4 Detector Cards. Additionally, WiMag Loop Detector Replacement Cards should not be mounted between SLD4 Cards as this would interrupt the infrared communications link between SLD4 Cards; referred to in the sections detailing Intelligent Detector Backplanes and SLD4 Cards.

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3.12 Loop Detector and Ancillary Power

Detector Power General

With reference to **Figure 31** an additional mounting panel is provided on the left hand side of the ST950 controller. This mounting panel will be utilised for mounting 48V (160VA) Wait Drive Kits, 48V (50VA) Wait Drive Kits, 24V (160VA) Supply Kits and Audible Supply Kits.

3.12.1 Power Supply Kit 24V (160VA)

All detectors will be powered from 24v (160VA) Supply kit. With reference to **Figure 31** the transformer, part of the 24V (160VA) Supply Kit, will be mounted to position 13. The rectifier and terminal block will be mounted on the left hand side of the left hand mounting plate. **Figure 31** also shows the sequence in which additional 24V (160VA). Supply Kits will be positioned. Additional reference should be made to drawing 667/GA/27067/000. The first position to be utilised should be position 13, followed by position 14 and 15 etc.

The transformer supplied in the kit will be configured with conventional mains leads. Main input for the Supply Kit should be obtained from the Mains Switch Assembly, as described on drawing 667/GA/20292/008. The output voltage from the Supply Kit should be connected to the Intelligent Detector Backplane as shown in paragraph 7 of this document and drawing 667/GA/20292/008.

3.12.2 Power Supply Kit 48V (50VA)

The 48V (50VA) may be specified to provide power to Wait Drives. The rectifier and terminal block will be mounted on the left hand side of the left hand mounting plate. **Figure 31** shows the sequence in which additional 48V (50VA) Supply Kits will be positioned. Main input for the Supply Kit should be obtained from the Mains Switch Assembly. Additional reference should be made to drawing 667/GA/27067/000. The first position to be utilised should be position 4, followed by position 5 and 6 etc. The position of the 48V (50VA) transformers should be optimised while also optimising the position of the 48V (160VA).

3.12.3 Power Supply Kit 48V (160VA)

The 48V (160VA) may be specified to provide power to Wait Drives. The rectifier and terminal block will be mounted on the left hand side of the left hand mounting plate. **Figure 31** show the sequence in which additional 48V (160VA) Supply Kits will be positioned. Main input for the Supply Kit should be obtained from the Mains Switch Assembly. Additional reference should be made to drawing 667/GA/27067/000. The first position to be utilised should be position 1, followed by position 2 and 3 etc. The position of the 48V (160VA) transformers should be optimised while also optimising the position of the 48V (50VA).

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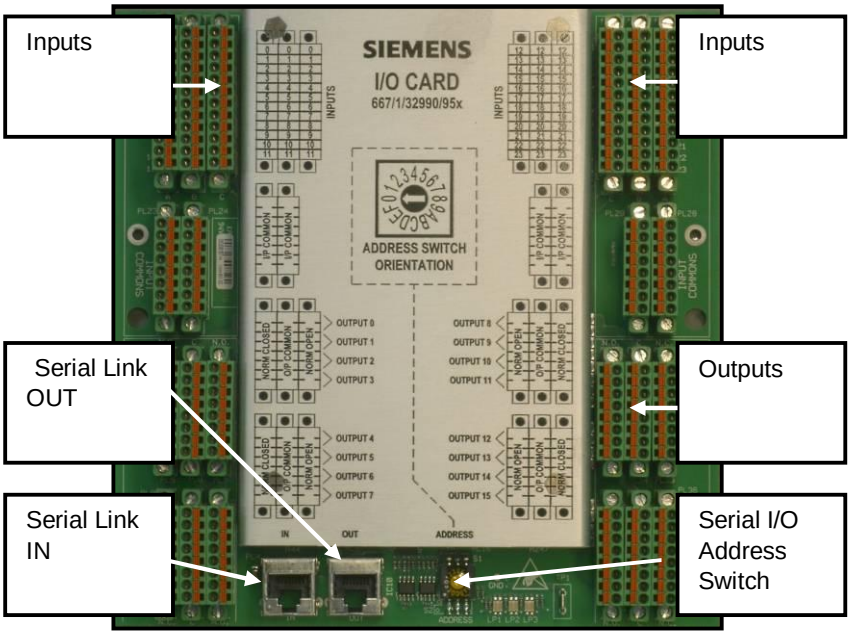
3.13 Serial I/O Cards

The Serial Input/Output (I/O) Kits do not form part of the Outercase selected from **Table 2** and therefore should be ordered separately. Two types of I/O cards, remote from the CPU Card, are available one with 4 outputs/16 inputs and one with 16 outputs/16 inputs. Four I/O cards can fit in the ST950. **Figure 26** sets out the stencil indications on the Terminal Panel, which aids position optimisation.

Figure 26 – Serial I/O Card



The I/O cards communicate with the CPU card via the RJ45 Cable/Cat5 connector, as a serial link. The serial link communication protocol relies on addressing techniques to ensure the appropriate information is delivered to the intended component. This means that the order in which the components are connected to the serial link is not imperative to successful communications. However, to maintain consistency of build the sequence of connections set out in **Table 2** should be used.

As stated above, once connected into the serial link, the CPU card indentifies the I/O by the appropriate address. The address is set on the I/O card, shown **Figure 26**. Controller special instructions will provide details on assigned inputs and outputs.

Figure 13, 15 and 27 illustrate the mutual optimisation that must be carried out when allocating space to both I/O card and Loop Termination Cards.

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Figure 27 – I/O Card Position Allocation

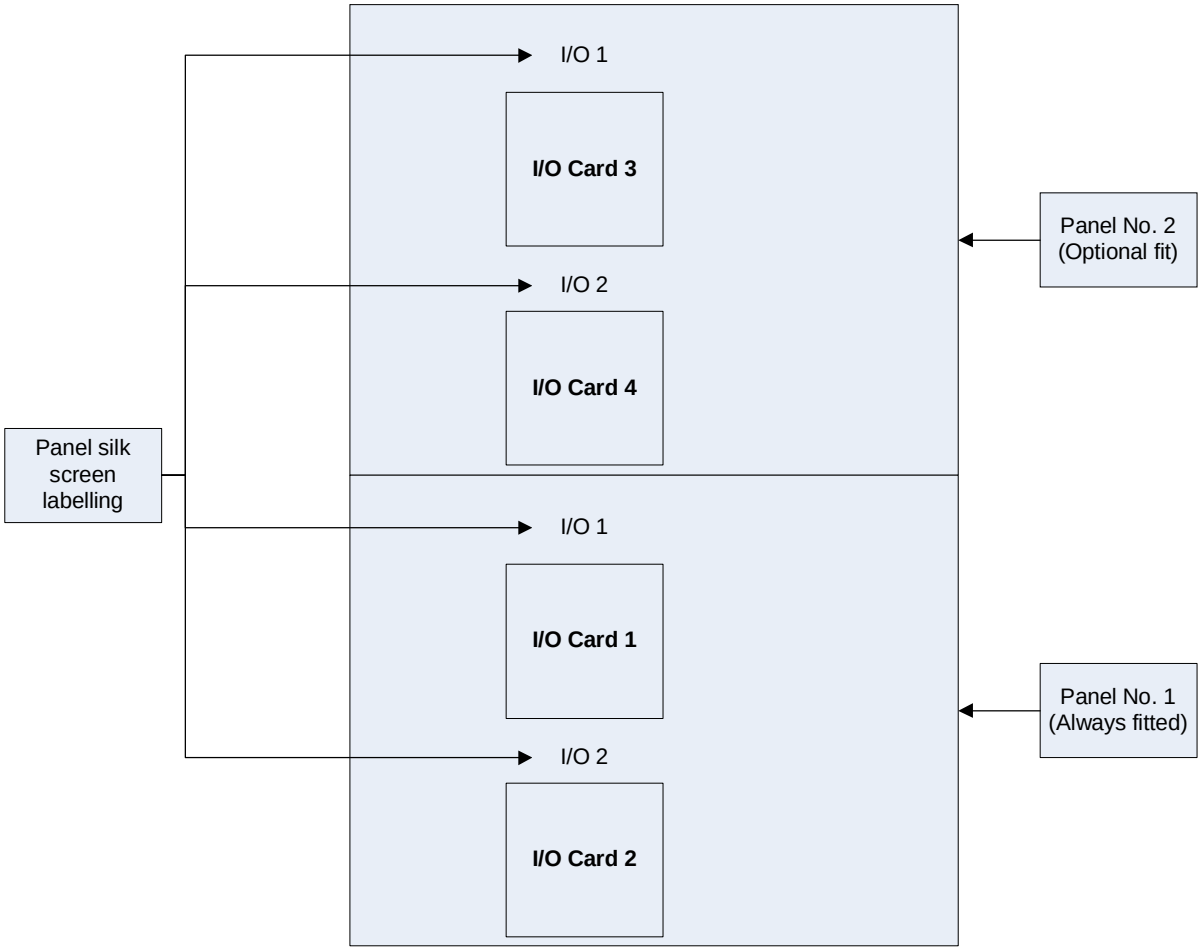

Figure 1 LV Cabinet I/O card allocation and no LT Cards Fitted

Card positions are silk screened I/O 1 etc
I/O Card 1 allocated to Panel 1, position I/O 1
I/O Card 2 Allocated to Panel 1, position I/O 2
I/O Card 3 allocated to Panel 2, position I/O 1
I/O Card 4 Allocated to Panel 2, position I/O 2

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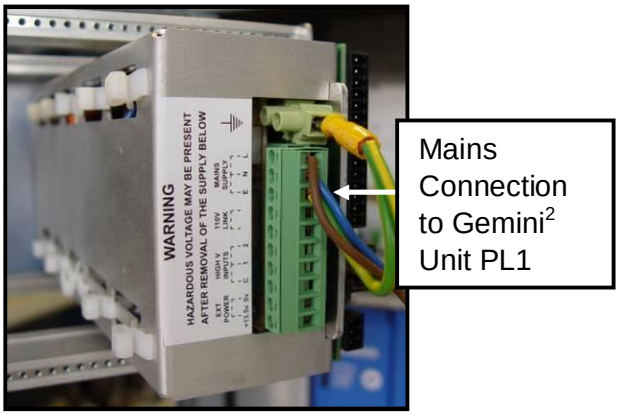
3.14 Gemini^2

The ST950 Outercase is configured with a 19" Swing Frame and a Rack Assembly. With reference to **Figure 8** the area above the Rack Assembly is set aside for 3U sized Gemini unit. Please also reference document 667/GA/27087/000, detailed in the related document section of the document. A 19" Rack Kit will be fitted to the ST950 as standard and need not ordered separately. When a 3U sized Gemini is specified it will be fitted on the right hand side of the 19" Rack Kit, as seen from the front of the 19" Swing Frame in **Figure 8**.

The Master Switch Unit has one OTU Supply Kit fitted to provide power for the Gemini Unit. A second kit may be fitted please refer to the parts listing for the appropriate part number. The position of the kit is shown on diagram 667/GA/27121/000. The Gemini unit has several applications; full information on the required configuration should be sought from the Gemini Family Tree, detailed in the Related Document section. With reference to **Figure 29,** power for the Gemini unit should be applied to PL1. It will be noted that the 19" Rack Assembly set aside for the Gemini Unit will be largely empty when the Gemini is specified and completely empty when Gemini Unit is not specified. Configuration Engineers and Production staff should note that if this space is utilised to fit Backplanes the controller may require substantial re-configuration at a later stage and should only be carried out if the work specification directs this activity.

Figure 28 - Power for Gemini Unit



Warning! *It is important that the Gemini Last Gasp Dial Battery, within the Gemini Power Supply Unit, is orientated correctly; the battery terminal must be facing up. If the unit is to be mounted in such a way that the battery terminals are not facing up then it is necessary to implement certain modifications to ensure that the battery is not operating upside down. Please refer to document 667/HB/32600/000 for the necessary modifications.*

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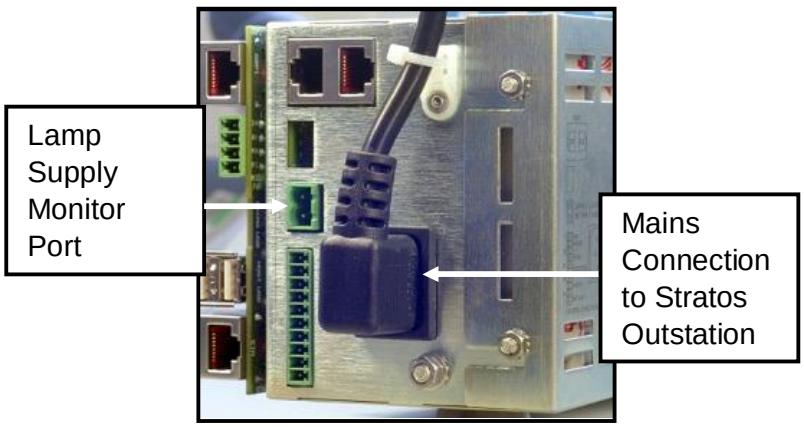
3.15 Stratos Outstation

The ST950 Outercase is configured with a 19" Swing Frame and a Rack Assembly. With reference to **Figure 8** the area above the Rack Assembly is set aside for Stratos Outstation. Please also reference document 667/GA/27087/000, detailed in the related document section of the document. A 19" Rack Kit will be fitted to the ST950 as standard and need not be ordered separately. When a Stratos Outstation is specified it will be fitted on the right hand side of the 19" Rack Kit, as seen from the front of the 19" Swing Frame in **Figure 8**.

The Master Switch Unit has one OTU Supply Kit fitted to provide power for the Stratos Outstation. A second kit may be fitted, please refer to the parts listing for the appropriate part number. The position of the kit is shown on diagram 667/GA/27121/000. The Stratos Outstation has several applications; full information on the required configuration should be sought from the Stratos Outstation Family Tree, 667/DZ/52250/ETC. With reference to **Figure 29,** mains supply power for the Stratos Outstation is connected via a standard IEC C13 mains lead. The other boards in the system are powered over the RJ45 GSPI cables. To provide Lamp Supply monitoring on the Stratos Outstation the Lamp Supply Monitor Port is used.

It will be noted that the 19" Rack Assembly set aside for the Stratos Outstation will be largely empty when the Stratos Outstation is specified and completely empty when Stratos Outstation is not specified.

Figure 29 - Power for Stratos Outstation Unit



If the internal backup battery is fitted the Stratos Outstation can be mounted in any orientation apart from front panel facing down.

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3.16 Regulatory Sign Supply Kit

The Mains Distribution Unit provides the power supply output for regulatory signs. The outputs to power the signs are provide at the bottom right of the Termination Panel. The controller comes equipped and wired with a lamp monitoring sensor as standard, which can monitor up to seven regulatory signs. If the junction contains more than seven signs in total additional current monitoring sensors must be fitted. The feeds to the signs must be split so that no more than seven signs are monitored through one sensor. The red wire from the sensors should be connected to the ‘Sens’ inputs at the rear of the first Lamp Switch card Sens33 is the first monitoring channel, Sens34 is the second etc. If more than 28 signs are present, additional sensors may be added to the second Lamp Switch card (if fitted). The white wires should be joined together and connected to the ‘COMMON’ input

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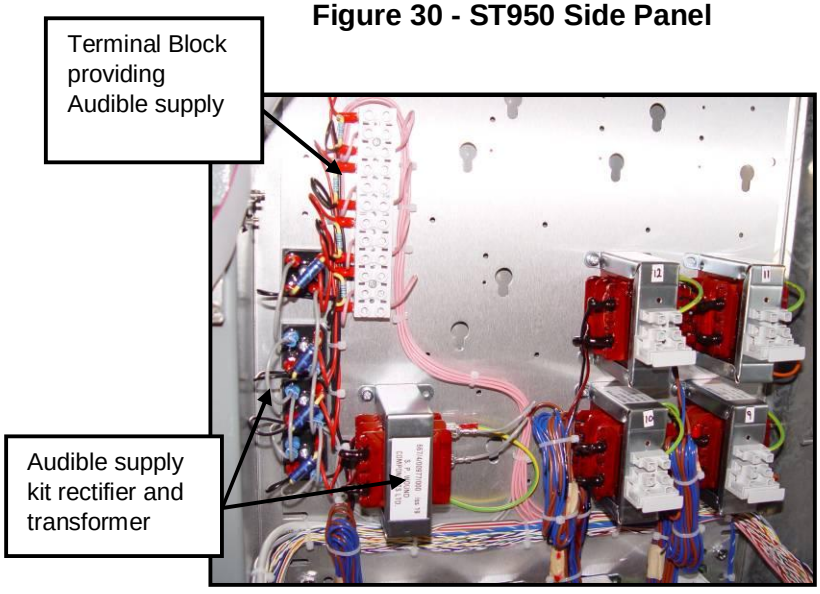
3.17 Audible Supply Kits

With reference to **Figure 31** an additional mounting panel is provided on the left hand side of the ST950 controller. This mounting panel will be utilised for mounting 48V (160VA) Wait Drive Kits, 48V (50VA) Wait Drive Kits, 24V (160VA) Supply Kits and Audible Supply Kits. The Audible Drive Kit contains a 48V (1500VA) transformer. The output from the transformer is rectified and made available at a terminal block. The terminal block forms part of the Audible kit and attached to the left hand side panel providing three outputs. If more than three Audible outputs are required it is possible to order individual ancillary items (terminal block etc) from the kit to provide an additional three outputs. If more than three additional outputs are required an additional full kit must be ordered. The position of the transformer in the Audible Supply kit is linked to the optimisation of the other supply kits positions. The sequence of kit positioning is set out in paragraph 7.17. Drawing 667/GA/27006/000 details the full wiring scheme. The Audible kit may occupy any spare position on the left hand mounting plate however the rectifier component and terminal block should be mounted in the same row as the transformer. Input Supply for the Audible Kit is provided from the pedestrian green phase. **Please note the negative input supply wire should not be connected to the common input of any other equipment.**

Figure 30 - ST950 Side Panel



3.18 Tactile Driver from Audible Supply Kit

Tactiles are driven from the Audible Supply Kit as detailed in Drawing 667/GA/27006/000. The same restrictions of number of outputs exist for Tactile as that for Audibles.

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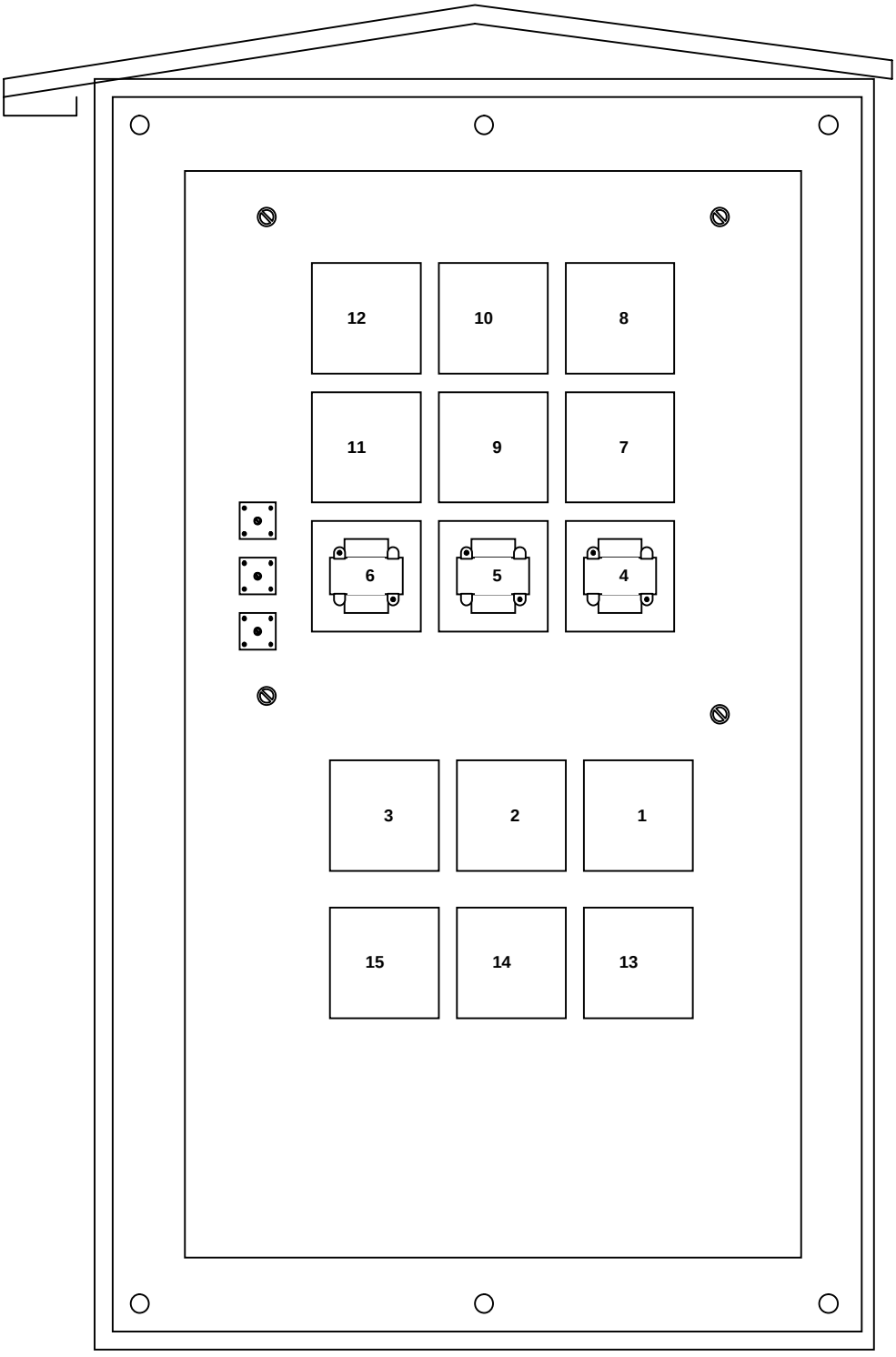
Figure 31 -ST950LV Side Panel View



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3.19 Solar Cell

The Mains Distribution Unit provides the power supply output for Solar Cell. The output to power is provided at the bottom right of the Termination Panel.

3.20 ST950LV Parts Listing

Table 3 – Parts Listing

Part Number	Description
667/1/46950/010	ST950 Cabinet UK 1.5KVA 8ph wired 8ph - Grey
667/1/46950/011	ST900 Cabinet UK 1.5KVA 8ph wired 8ph - Black
667/1/46950/018	ST950 Cabinet UK 0.5KVA 8ph wired - Grey
667/1/46950/019	ST950 Cabinet UK LED 0.5KVA 8ph wired - Black
667/1/46950/020	ST950 Cabinet UK 3.0KVA 24ph wired - Grey
667/1/46950/021	ST950 Cabinet UK 3.0KVA 24ph - Black
667/1/46950/028	ST950 Cabinet UK LED 0.5KVA 24ph wired - Grey
667/1/46950/029	ST950 Cabinet LED 0.5KVA 24ph wired - Black
667/1/32900/000	Expansion cabinet kit - Grey
667/1/32900/001	Expansion cabinet kit - Black
667/1/27056/001	Manual Panel Full Kit
667/1/27110/000	Manual Panel RS232 kit
667/1/27002/000	8 Phase UK Lamp Switch Kit
667/1/27008/001	16 - 32 phase controller upgrade kit
667/1/27072/001	Phase Driver Cableform
667/1/46085/002	ST950 I/O Card Kit (4 Output)
667/1/46085/001	ST950 I/O Card Kit (16 Output)
667/1/46014/000	ST950 CPU I/O kit (4 outputs)
667/1/45952/001	ST950 CPU I/O kit (4 outputs) Cableform
667/1/20690/000	19” Detector Rack
667/1/32910/000	ST900 Intelligent detector backplane kit (contains Loop Termination Card)
6671/27690/000	Second Termination Panel
667/1/15990/003	Single Detector Backplane

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Part Number	Description
667/1/47210/100	WiMag standard interface card kit
408/4/54224/000	4 Port POE Switch
408/4/54225/000	8 Port POE Switch
667/1/47280/000	WiMag loop detector replacement card
995/4/88351/005	WiMag loop detector replacement card linking ethernet cable
667/1/27084/500	0.5 KVA Dimming Facility (LED controllers only)
667/1/27084/001	1.5 KVA Dimming Facility (non LED controller only)
667/1/27084/003	3.0 KVA Dimming Facility (non LED controllers only)
667/1/27104/000	DFM lens kit
667/1/27121/000	OTU Supply Kit
667/7/25171/001	Current Monitoring Torroid
667/1/33073/000	Isolator locking kit
667/6/46680/000	Anti graffiti coating
667/2/20234/000	Screw Lock Key
667/1/27006/000	Audible Supply Kit (Note Tactiles Driven from Audible)
667/1/20292/008	24V(160VA) Supply Kit
667/1/21029/003	48V(50VA) Wait Driver Kit
667/1/21029/001	48V(160VA) Wait Driver Kit
667/1/10039/024	Solar Cell
667/1/32994/001	Backplane SLD4 Link Cable (short)
667/1/32994/002	Backplane SLD4 Link Cable (long)

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4 ST950ELV HARDWARE ALLOCATION AND CONNECTIVITY

4.1 ST950ELV Outercase Selection

With reference to **Table 4** the ST950ELV can be specified as two base options; the ST950ELV with 20A load capability or the ST950ELV with 40A capability. Please refer to the ST950ELV General Handbook, detailed in the Related Documentation section, for full specifications. With knowledge of the potential load requirement and with reference to paragraph 4.2 the basic functional cabinet can be selected from **Table 4**. The Outercases listed in **Table 4** are equipped, at order time for onward configuration, with the following major items;

- Appropriate number of HPU PCBs.
- LPU
- Appropriate number of Mains Transformers.
- Master Switch Assembly
- Back Panel
- LSLS Backplane Kits and associated LSLS cards

The basic functional units for the controller are contained within the ST950ELV Controller 6U Rack Assembly. This unit can be ordered as a standalone (Cuckoo) unit and fitted to a controller cabinet. More often the unit will be ordered as part of a fully functioning controller. Please note, the involved relationship between choice of Outercase, number HPU Cards and number of LSLS cards is explained below.

Table 4 – ST950ELV Outercase Selection

Part Number	Description
667/1/45950/020	ST950ELV Cabinet UK 20A Single LSLS - Grey
667/1/45950/040	ST950ELV Cabinet UK 40A Single LSLS - Grey
667/1/45950/021	ST950ELV Cabinet UK 20A Single LSLS - Black
667/1/45950/041	ST950ELV Cabinet UK 40A Single LSLS - Black
667/1/45950/520	ST950ELV 20A Single LSLS Low Inrush -Grey
667/1/45950/521	ST950ELV 20A Single LSLS Low Inrush -Black

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4.2 Rack Assembly, LSLS and HPU

4.2.1 Rack Mounting Position

The ST950ELV Outercase is configured with a 19 inch swing frame, to which the ST950ELV Rack Assembly is mounted. The Rack Assembly will be positioned in the Swing Frame as shown in **Figure 32**. Information on exact positioning of the ST950ELV Rack Assembly should be sought from manufacturing drawing detailed in the related document section of this handbook. The whole ST950ELV Rack Assembly should **not** be ordered separately as it is included in the Outercase, ordered from **Table 4**, however, some components in the Rack Assembly do not come as standard and should be ordered to suit individual configurations. Components mounted within the ST950ELV Rack Assembly are shown in **Figure 32**

Figure 32 – ST950ELV

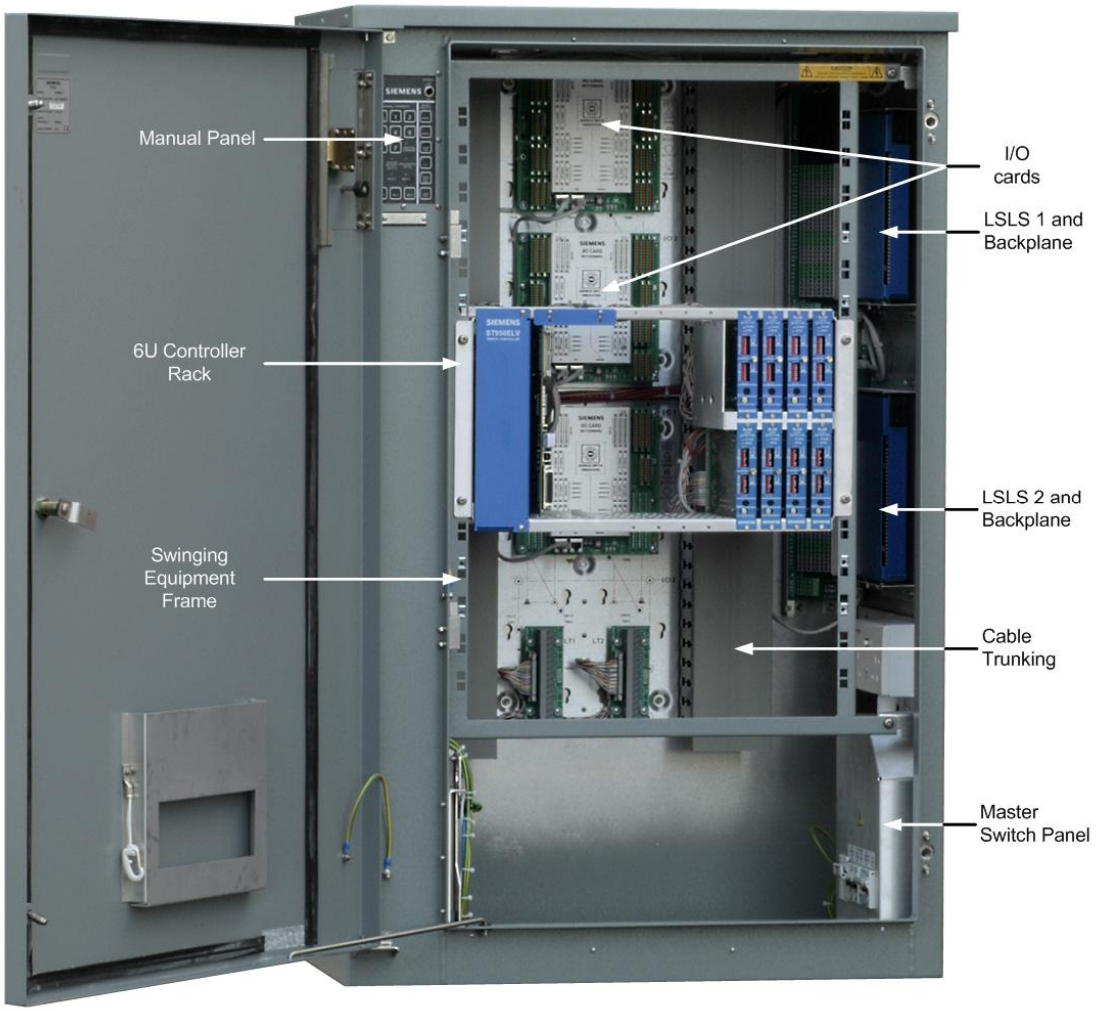

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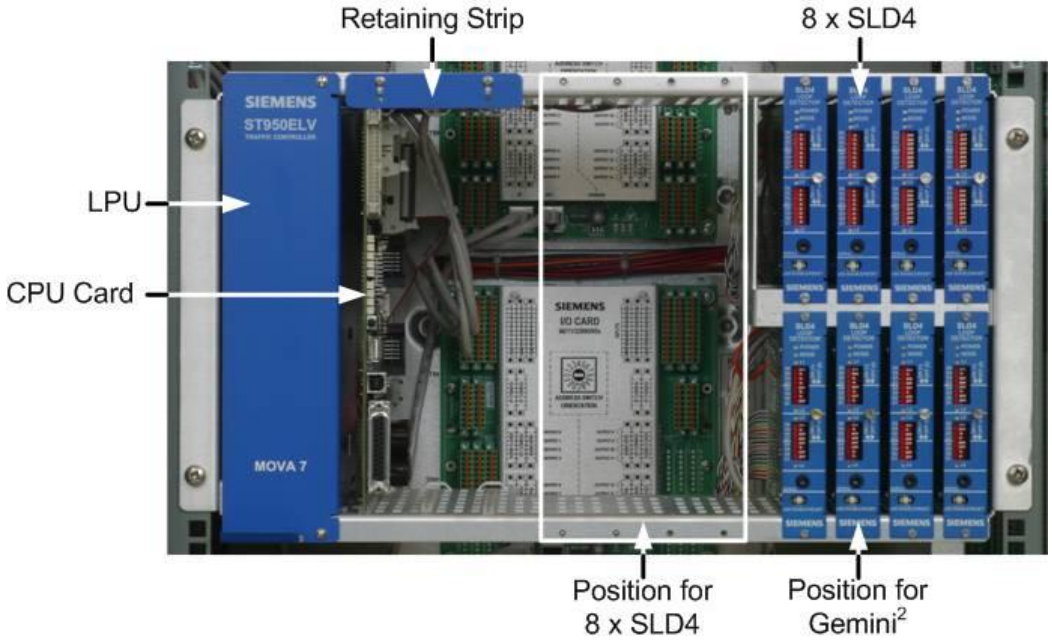
Figure 33 –ST950ELV Rack Assembly



4.2.2 Logic Power Unit

The LPU (Logic Power Unit) is powered by the Mains 230V AC supply and is contained within the Rack Assembly, refer to **Figure 33** A switch-mode power supply mounted in the LPU produces +5V and +24V DC supplies used by PCBs within the cabinet. The Logic power Unit does not need to be ordered separately as it is contained within the Rack Assembly.

4.2.3 ST950ELV CPU Card

The ST950 CPU Card will be mounted to a designated position in the Rack Assembly, as shown in **Figure 33**. The CPU Card holds the controller configuration and performs the function of configuration, control and management. The main external data interfaces of the CPU Card are:

- Interface to Lamp Switch Cards
- Serial Interfaces (GSPI) to IO Cards and Intelligent Detector Backplanes
- Manual Panel
- RS232 interface to handset, Gemini^2 or Stratos Outstation
- USB interfaces
- Ethernet Interface

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4.2.4 CPU I/O Card

The ST950 Controller can be equipped with additional Input/Output cards, remote from the CPU card. However, the ST950 can also be equipped with a CPU I/O Card, mounted in a daughter board arrangement on the CPU Card. Please refer to **Figure 34**.

Figure 34 – CPU I/O Card

The CPU I/O Card is **not** supplied in the Outercase chosen from **Table 4**. Ultimately all I/O signals are returned to / derived from the ST950 Processor. The ST950 CPU Card, CPU I/O card, and other components described later in this handbook (I/O cards on the termination panel and Intelligent back planes) communicate via a GSPI serial interface. The serial communication is carried out over Cat5e cable. The serial Link relies on addressing techniques to ensure that the appropriate information is delivered to the correct component, therefore the order of the connections does not have an influence on the operation of the serial link. However, for purposes of consistency the order of connection set out in **Table 5** should be used. When a component is not fitted the serial link continued onto the next component in the sequence.

Table 5 – Serial Link Connections

Component	Input	Output
CPU card	Serial link derived from CPU card	RJ45 Serial Link Output Socket
CPU I/O Card	RJ45 Serial Link Input	RJ45 Serial Link Output
Termination Panel Upper I/O Card	RJ45 Serial Link Input	RJ45 Serial Link Output
Termination Panel Lower I/O Card	RJ45 Serial Link Input	RJ45 Serial Link Output
First Intelligent Detector Backplane	RJ45 Serial Link Input	RJ45 Serial Link Output
Second Intelligent Detector Backplane	RJ45 Serial Link Input	RJ45 Serial Link Output

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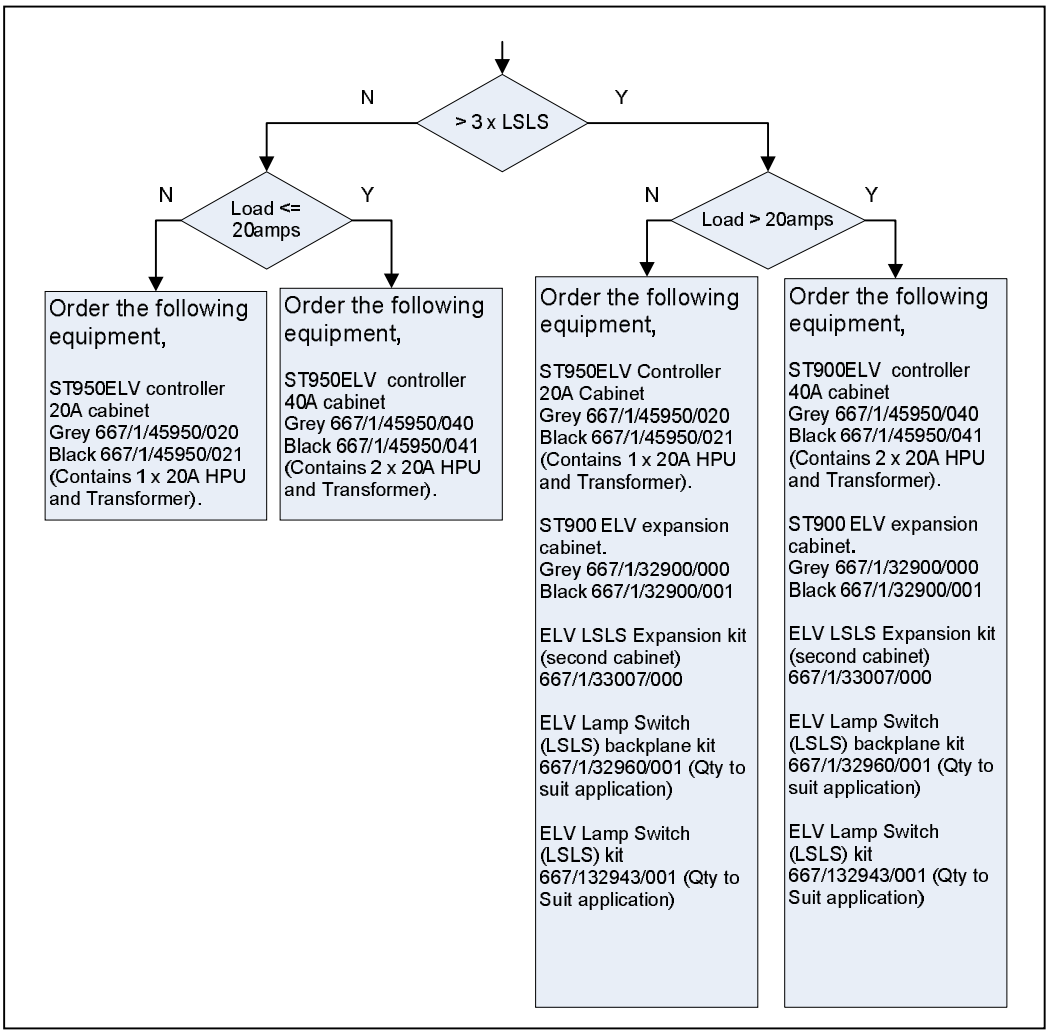
4.2.5 LSLS and HPU

LSLS and HPU Selection

Following an evaluation of the stream, phases and lanterns to be served by a controller the number of required LSLS cards can be calculated. Please refer to ST950ELV controller General Handbook for further details on load calculations. **Figure 35** and **Figure 36** also provide information on the Outercase required to accommodate the load and equipment. LSLS cards are allocated to specific positions in a specific order, as detailed in **Figure 36**. With further reference to **Figure 35** and 35 there may be occasions when the combination of cabinet components required will not be accommodated in one controller cabinet, (e.g. when more than three LSLS cards are required). To avoid the requirement for an entire additional controller a Miscellaneous Equipment Cabinet (MEC) can be specified.

Figure 35 – ST950ELV LSLS, HPU Selection



On those occasions when a customer has a specific requirement to ensure that the inrush current of a controller is kept to a minimum it is possible to specify a low inrush version of the 20A cabinet. Please refer to **Table 4**.

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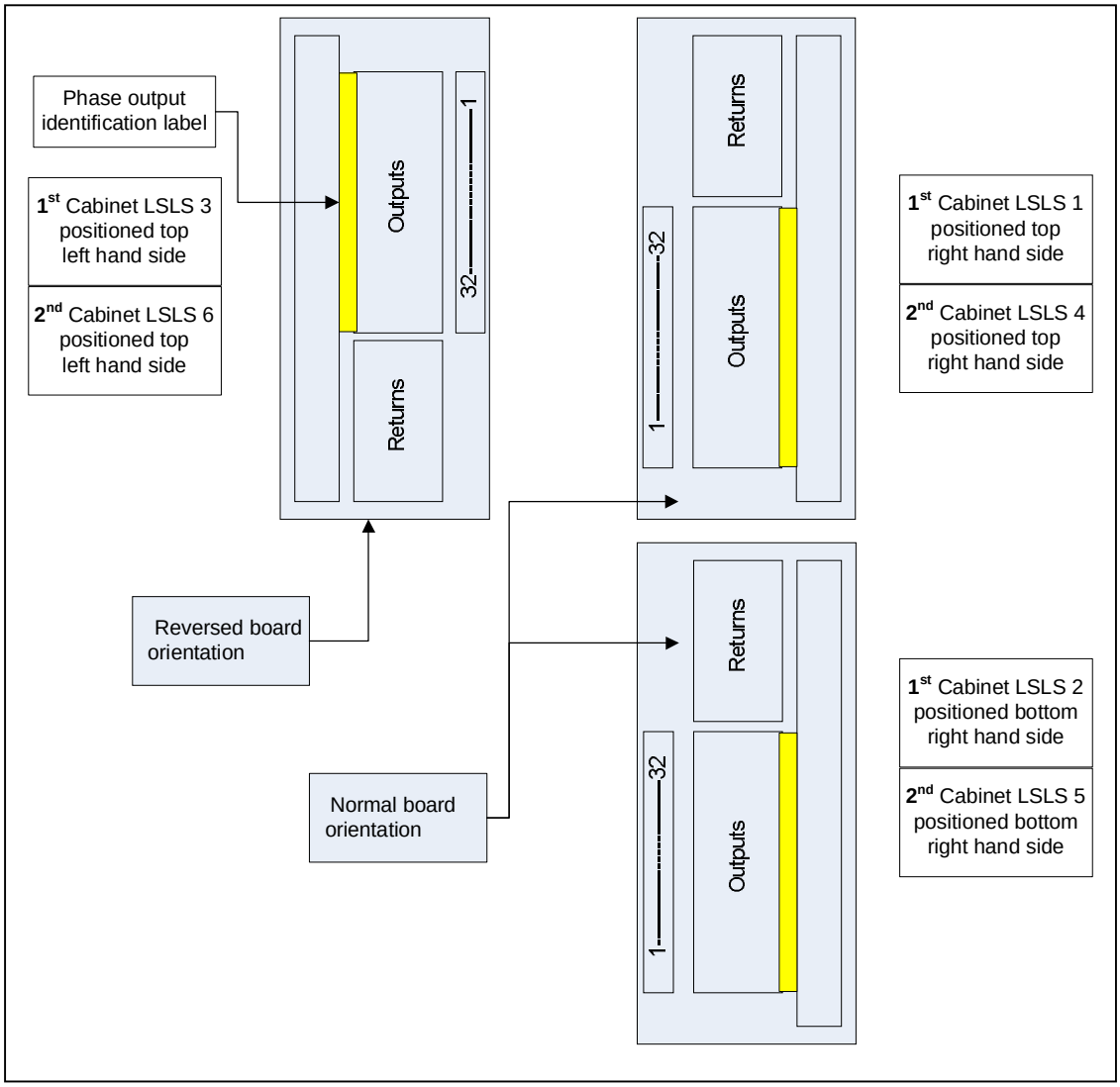
LSLS Cards Positioning

Each LSLS card is inserted into an LSLS Backplane Card. The configuration tool IC4 will allocate the positioning of the phase output identification label. **Figure 36** is a representation of the back panel in the ST950ELV. The first LSLS card Serial Link socket is connected to LSLS Serial Link Socket on the CPU card. The Serial link OUT socket is connected into the second LSLS IN Serial Link socket. The remaining LSLS cards are connected into the Serial Link in the same manner. The position of the LSLS Cards/LSLS Backplane cards as follows; LSLS Backplane Card 1 will always be fitted in the top right of the first cabinet. LSLS card 4 will occupy the same position in the second cabinet. LSLS 2 will occupy the position immediately below LSLS 1 on the right hand side of the first cabinet. LSLS 5 will occupy the same position in the second cabinet. LSLS 3 will occupy a position on the upper left corner of the first cabinet and LSLS 6 will occupy the same position in the second cabinet.

Figure 36 –ST950ELV LSLS Positioning



HPU Load Distribution and LSLS Connection

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With reference to the flow chart in **Figure 35** it can be seen that a combination of HPU and LSLS cards may be fitted to a controller, chosen from **Table 4**. To ensure that the lamp load is distributed evenly and ensure maximum power supply flexibility is maintained under varying circumstances, the following connection scheme should be followed.

With reference to **Table 6**, in order that the load may be redistributed, at final configuration, LSLS 3 is connected to HPU 1. The addition loom length required for this connection will allow the LSLS 3 connection to be removed from HPU 1 PL6 and connected to HPU 2, if required.

Table 6 – HPU Load Distribution

Cabinet Type	Number of HPU Fitted	Number of LSLS Fitted	Connection scheme
Single Cabinet 20A Version	One	One	Connect HPU 1 PL4 to LSLS 1 backplane PL3
Single Cabinet 20A Version	One	Two	Connect HPU 1 PL4 to LSLS 1 backplane PL3 Connect HPU 1 PL6 to LSLS 2 backplane PL3
Single Cabinet 20A Version	One	Three	Connect HPU 1 PL4 to LSLS 1 backplane PL3 Connect HPU 1 PL6 to LSLS 2 backplane PL3 Connect HPU 1 PL7 to LSLS 3 backplane PL3
Single Cabinet 40A Version	Two	Two	Connect HPU 1 PL4 to LSLS 1 backplane PL3 Connect HPU 2 PL4 to LSLS 2 backplane PL3
Single Cabinet 40A Version	Two	Three	Connect HPU 1 PL4 to LSLS 1 backplane PL3 Connect HPU 2 PL4 to LSLS 2 backplane PL3 Connect HPU 1 PL6 to LSLS 3 backplane PL3

4.2.6 Regulatory Sign Monitoring

With reference to paragraph 4.16 below, Regularity Sign monitoring is performed (if required) by LSLS external monitor input channels. It is important that the HPU regularity sign monitoring connection is made to the same LSLS backplane as the HPU power supply connection.

Output channels are configured using the appropriate software configuration tools (IC4).

On those occasion when more than 8 regularity signs are required but a second HPU is not specified please refer to paragraph 4.16.

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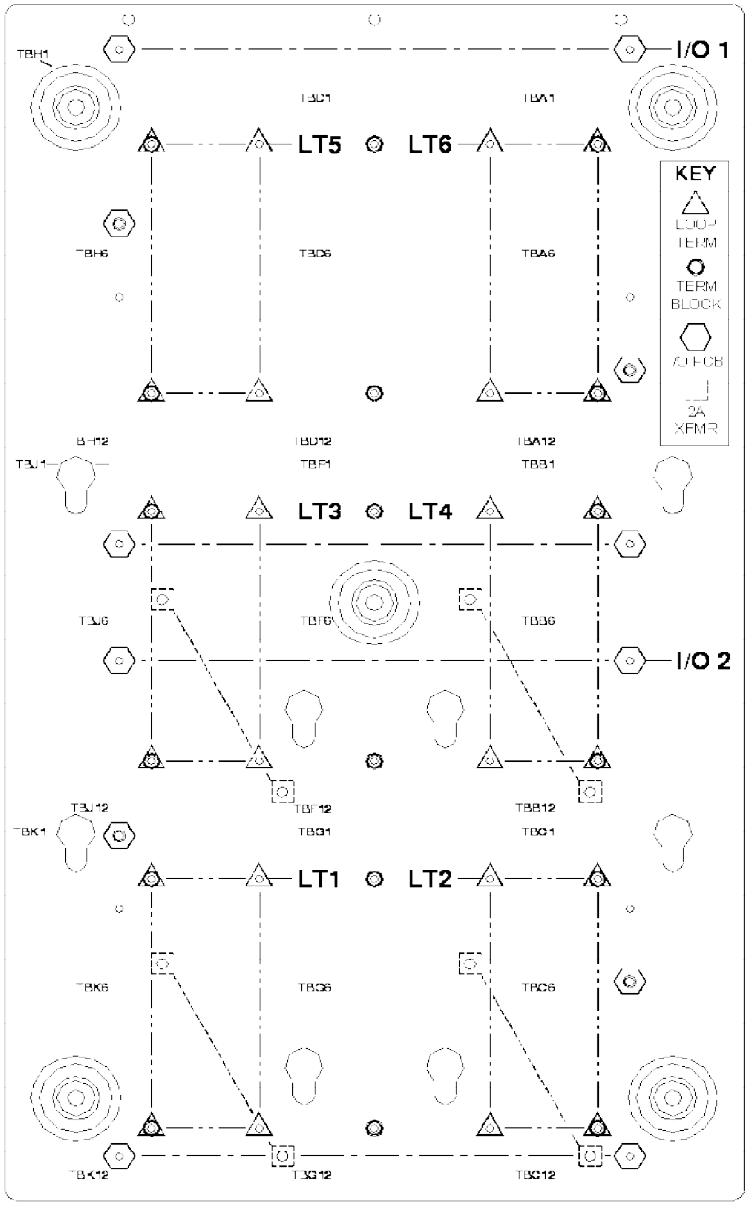
4.3 Cabinet Back Panel

Two back panels will be positioned centrally at the rear of the ST950ELV cabinet, one above the other. These items do **not** have to be ordered separately as they are contained within the cabinet chosen from **Table 4**. Stencil graphic aid the positioning of several components. Two Back Panes will be fitted to both the 20A ST950 Controller and the 40A ST950 Controller.

Figure 37 - ST950ELV Back Panel



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4.4 Master Switch Unit

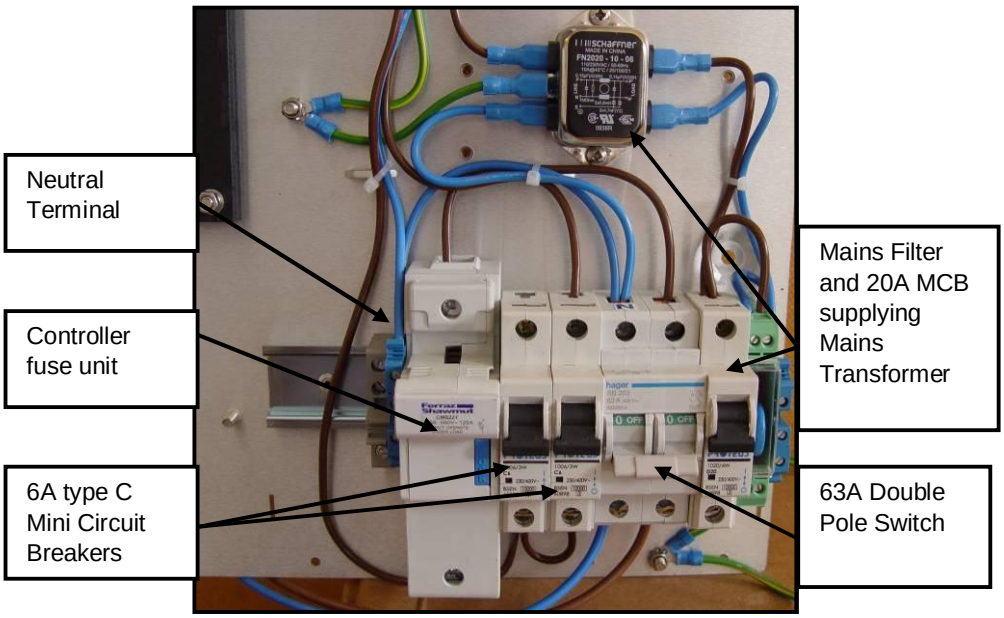
The Master Switch Assembly forms part of the Outercase, chosen from **Table 4**, and therefore should **not** be ordered separately. With reference to **Figure 38** the main supply voltage is applied to the main ON/OFF 63A double pole switch, within the Master Switch Assembly, for onward supply to the ST900ELV Traffic Controller.

The live connection is taken from the main ON/OFF switch and applied to the 30A controller fuse unit. The output from the fuse unit is applied to a mains filter, detailed in **Figure 38**, for onward distribution, via a dedicated 20A MCB, to the mains transformer.

Additional outputs are taken from the fuse unit and supplied to additional 6A Mini Circuit Breakers. These additional 6A type C mini circuit breakers provide the controller working supplies, independent of the main controller power - for example, to cabinet illumination or Gemini unit or Stratos Outstation.

Neutral distribution is provided from the 63A switch by connecting the neutral output terminal of the 63A switch to a separate neutral terminal, as shown in **Figure 38**.

Figure 38 – ST950 Master Switch Assembly


Neutral Terminal
Controller fuse unit
6A type C Mini Circuit Breakers
Mains Filter and 20A MCB supplying Mains Transformer
63A Double Pole Switch

Low Inrush Controller

Please note, the configuration of the master switch unit on the Low Inrush Controller variants will be different from the Master Switch Unit described above. In particular a 6 Amp type D MCB will be set in place of the 20A MCB on the Low Inrush controller. It is important to note that the 6A type C MCBs, used to supply the controller working supplies on the standard Controller, are not interchangeable with the Low Inrush, main supply, 6A type D MCB. Please refer to the ST950 General Handbook for further clarification on this point.

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4.5 Mains Transformer

The appropriate transformer is contained with the Outer case specified in **Table 4** and should **not** be ordered separately. The mains transformers will occupy a position in the bottom left hand corner of the controller. Please refer to **Figure 39**, which shows one transformer fitted to the ST950ELV cabinet. On those occasions when a 20A variant of the controller is chosen one transformer and one HPU will be provided, to supply the appropriate load. When a 40A Outercase is specified an additional transformer and HPU Card will installed, alongside the first transformer and HPU Card. Individual leads from the transformer will be connected to SKT 3 on the high power to the HPU Card. A loom from the transformer will be connected into PL5 on the HPU. On those occasions when a 40A Outercase is specified the corresponding connection from the second transformer will be connected to the corresponding connections on the second HPU Card. If a 40A controller has been specified and therefore a second HPU PCB is fitted a four way relay connection cable will be inserted between PL1 on the first HPU Card and PL2 on the second HPU Card.

The input voltage to the Dimming Transformer can be selected by connecting the input supply leads to the appropriate terminals. Please refer to the ST950 General Handbook Please note that a low Inrush version of the ST950 controller is available. Please refer to **Table 4**.

Figure 39 – ST950 HPU and Transformer

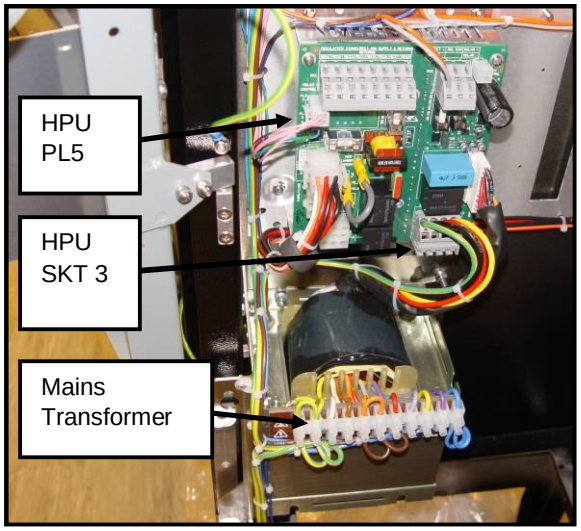
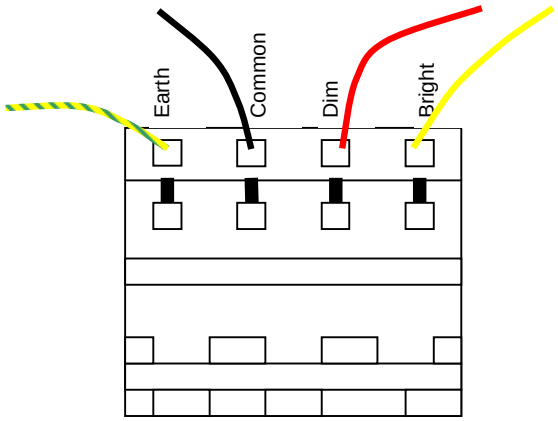


Figure 40 – SKT3



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4.6 Manual Panel

The Manual Panel is contained within a secure compartment in the top left hand corner of the controller cabinet. Access to the manual panel may be gained via the manual panel access door or by opening the controller cabinet main door. The manual panel forms part of the Outercase, chosen from **Table 4**, and therefore should **not** be specified separately. The 34 way ribbon cable from manual panel connects into socket manual panel connection on the CPU Card.

Figure 41 – ST950 Manual Panel

4.7 Intelligent Detector Backplanes

Intelligent Detector Backplanes do not form part of the base Controller Cabinet and therefore should be specified separately. Each Intelligent Detector accommodates four SDL4 Cards. Notes on the SLD4 Detector Cards are provided later in this document. **Figure 50** provides a listing of required components when selecting the Intelligent Detector Backplanes and accompanying SLD4 cards. Please also refer to the parts list for these items.

Optimising the positions of Intelligent Detector Backplanes within the ST950ELV is an involved but necessary procedure. The four separate cases, detailed in **Case 1** – 1 Intelligent Detector Cards (4 Loop detector cards) and a Gemini unit or Stratos Outstation

Figure 42 to 45, define the order of allocation for the Intelligent Detector Backplanes in the 6U Rack, and therefore the positioning of the Detector cards, which are detailed later in this document. Connection of the twisted ribbon cable between detector loop termination cards to appropriate intelligent detector backplane is also detailed in **Case 1** – 1 Intelligent Detector Cards (4 Loop detector cards) and a Gemini unit or Stratos Outstation

Figure 42 to 45.

In the following series of case studies it is necessary to install the appropriate Rack Assembly dividers. Please consult the parts listing for these necessary dividers. Please note, the position in the rack of the Intelligent Detector Backplanes depends on the number of loop detector cards required.

Configuration Engineers should note when referencing the cases below that an infrared communication link provides automatic set-up between SLD4 cards. This link operates horizontally but not vertically. To provide this link between vertically mounted SLD4 cards a link cable should be fitted between Intelligent Detector Backplanes on associated horizontal levels. Please refer to parts listing for link cable. Please also refer to **Figure 47** which shows the required link.

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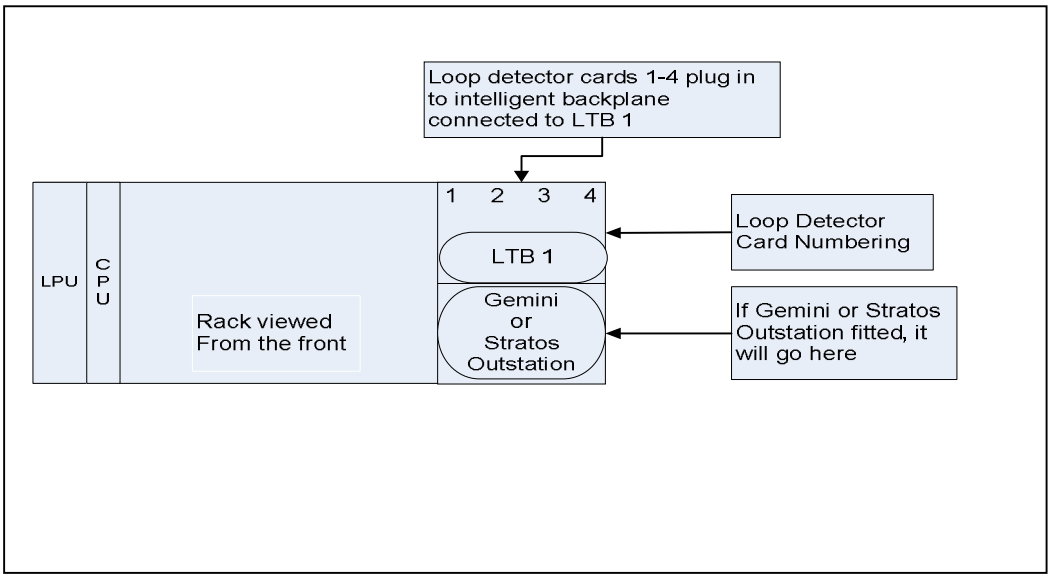
Important Note

Configuration Engineers should read the notes in the WiMag section regarding Backplane positioning. Important information on the relationship between SDL4 Cards, the Infrared communication link between SLD4 cards and the restrictions this communication technique has on the positioning of Detector

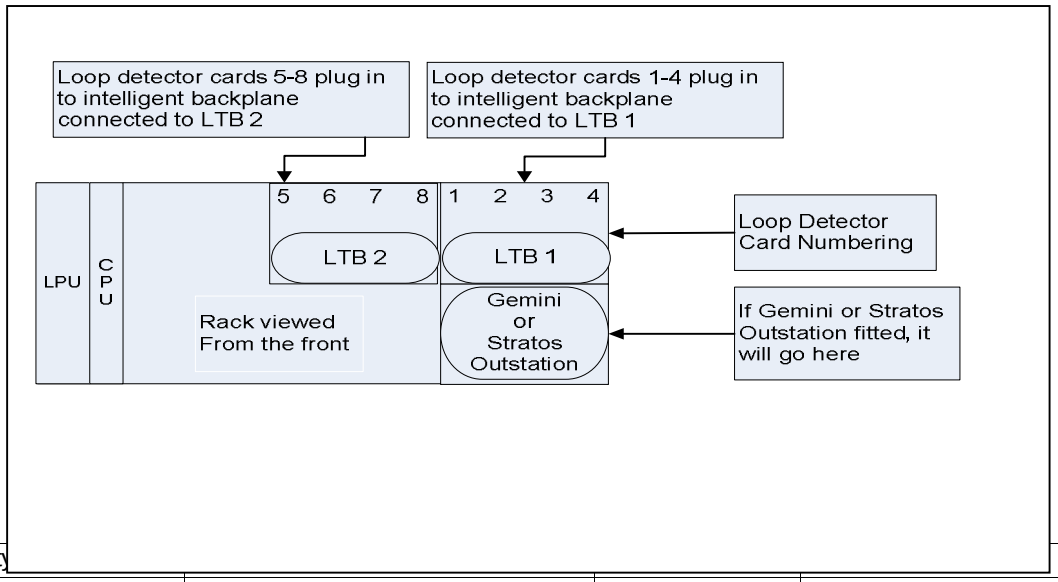
Case 1 – 1 Intelligent Detector Cards (4 Loop detector cards) and a Gemini unit or Stratos Outstation

Figure 42- IDB Optimisation


Loop detector cards 1-4 plug in to intelligent backplane connected to LTB 1
1 2 3 4
LTB 1
Loop Detector Card Numbering
LPU
C P U
Rack viewed From the front
Gemini or Stratos Outstation
If Gemini or Stratos Outstation fitted, it will go here

Case 2 – 2 Intelligent Detector Cards (8 Loop detector cards) and a Gemini unit or Stratos Outstation

Figure 43 – IDB Optimisation


Loop detector cards 5-8 plug in to intelligent backplane connected to LTB 2
Loop detector cards 1-4 plug in to intelligent backplane connected to LTB 1
5 6 7 8
1 2 3 4
LTB 2
LTB 1
Loop Detector Card Numbering
LPU
C P U
Rack viewed From the front
Gemini or Stratos Outstation
If Gemini or Stratos Outstation fitted, it will go here

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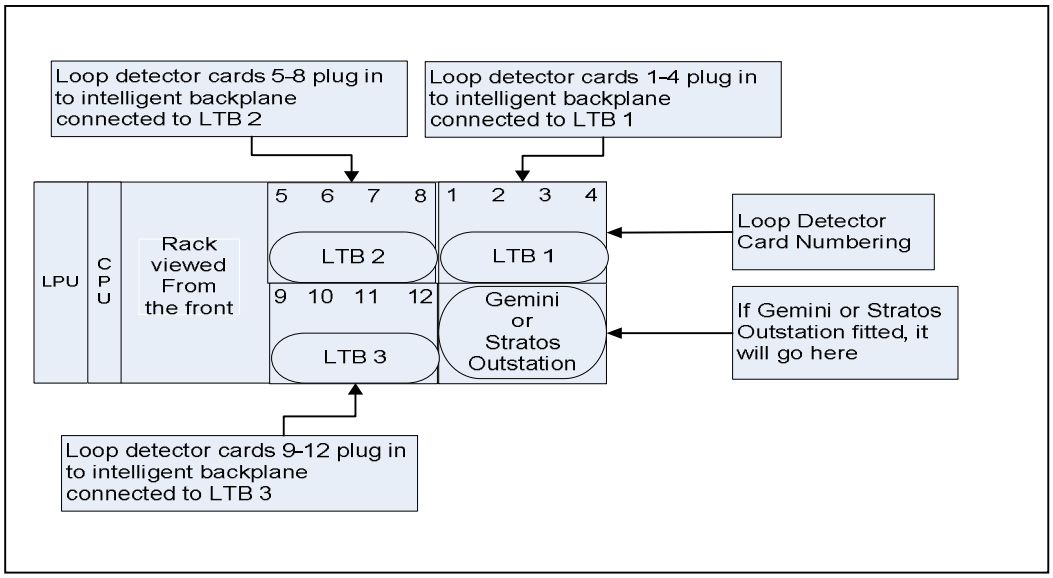
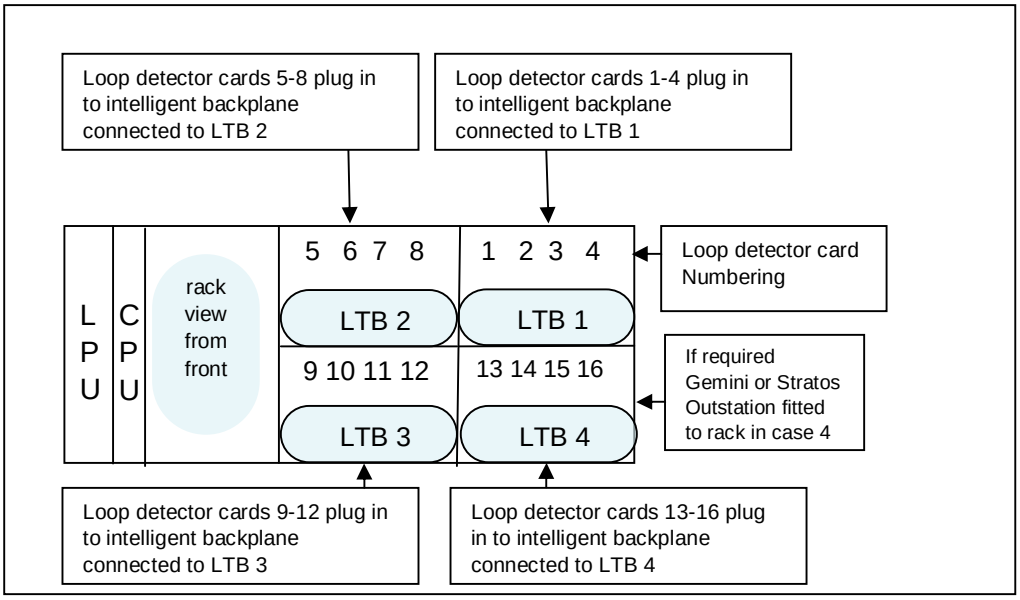
Case 3 – 3 Intelligent Detector Cards (12 Loop detector cards) and a Gemini unit or Stratos Outstation

Figure 44 - IDB Optimisation


Loop detector cards 5-8 plug in to intelligent backplane connected to LTB 2
Loop detector cards 1-4 plug in to intelligent backplane connected to LTB 1
LPU
CPU
Rack viewed From the front
5 6 7 8
1 2 3 4
LTB 2
LTB 1
9 10 11 12
LTB 3
Gemini or Stratos Outstation
Loop Detector Card Numbering
If Gemini or Stratos Outstation fitted, it will go here
Loop detector cards 9-12 plug in to intelligent backplane connected to LTB 3

Case 4 – 4 Intelligent Detector Cards or more (16 Loop detector cards or more) and a Gemini unit or Stratos Outstation

Figure 45 – IDB Optimisation


Loop detector cards 5-8 plug in to intelligent backplane connected to LTB 2
Loop detector cards 1-4 plug in to intelligent backplane connected to LTB 1
LPU
CPU
rack view from front
5 6 7 8
1 2 3 4
LTB 2
LTB 1
9 10 11 12
13 14 15 16
LTB 3
LTB 4
Loop detector card Numbering
If required Gemini or Stratos Outstation fitted to rack in case 4
Loop detector cards 9-12 plug in to intelligent backplane connected to LTB 3
Loop detector cards 13-16 plug in to intelligent backplane connected to LTB 4

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Case 4 Continued – 4 Intelligent Detector Cards (16 Loop detector cards) and a Gemini unit or Stratos Outstation
First 16 loop detector cards go in main rack as Gemini Unit or Stratos Outstation in an Additional Rack

Figure 46 – IDB Optimisation

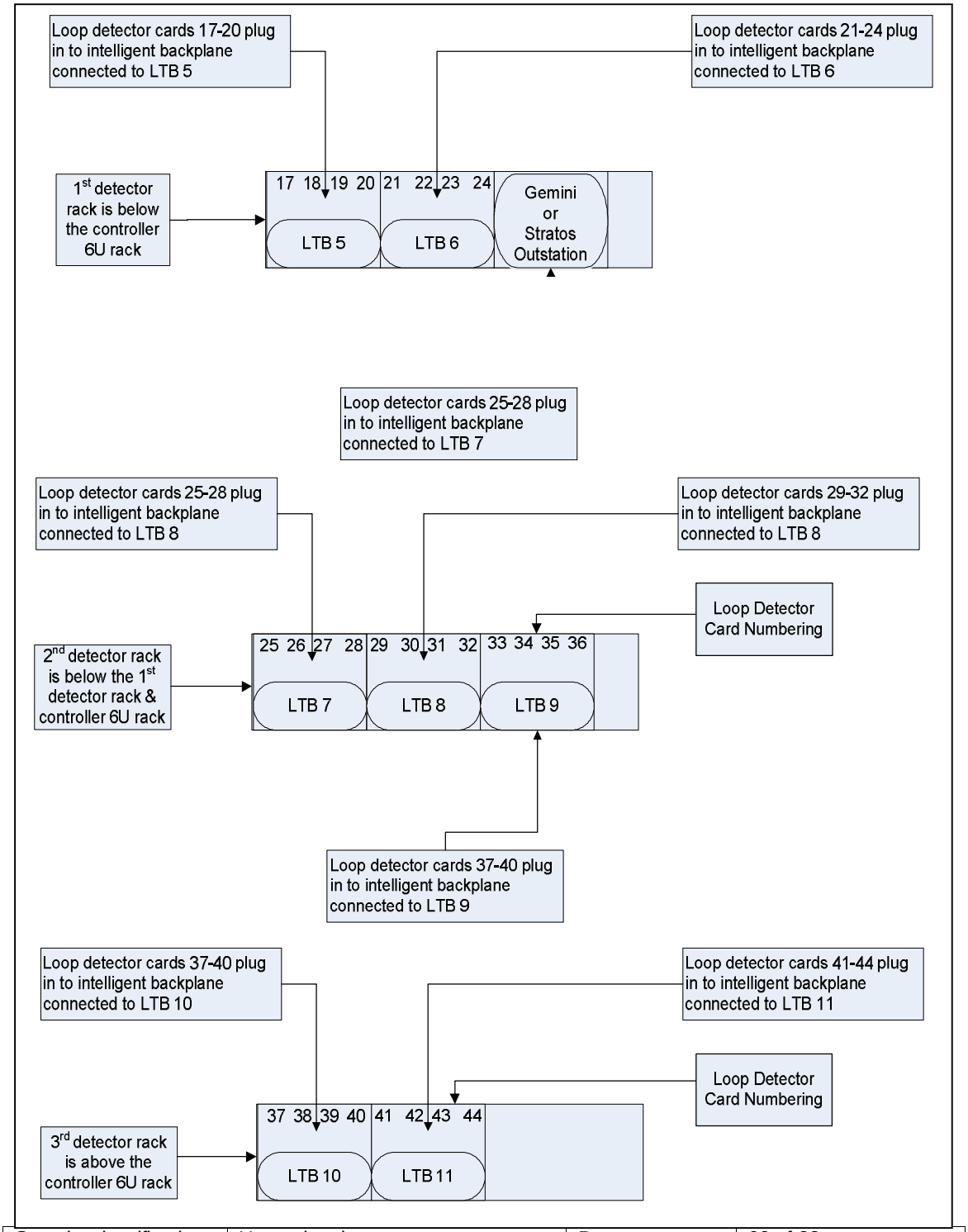
Loop detector cards 17-20 plug in to intelligent backplane connected to LTB 5
Loop detector cards 21-24 plug in to intelligent backplane connected to LTB 6
1st detector rack is below the controller 6U rack
17 18 19 20 21 22 23 24
Gemini or Stratos Outstation
LTB 5
LTB 6
Loop detector cards 25-28 plug in to intelligent backplane connected to LTB 7
Loop detector cards 25-28 plug in to intelligent backplane connected to LTB 8
Loop detector cards 29-32 plug in to intelligent backplane connected to LTB 8
Loop Detector Card Numbering
2nd detector rack is below the 1st detector rack & controller 6U rack
25 26 27 28 29 30 31 32 33 34 35 36
LTB 7
LTB 8
LTB 9
Loop detector cards 37-40 plug in to intelligent backplane connected to LTB 9
Loop detector cards 37-40 plug in to intelligent backplane connected to LTB 10
Loop detector cards 41-44 plug in to intelligent backplane connected to LTB 11
Loop Detector Card Numbering
3rd detector rack is above the controller 6U rack
37 38 39 40 41 42 43 44
LTB 10
LTB 11

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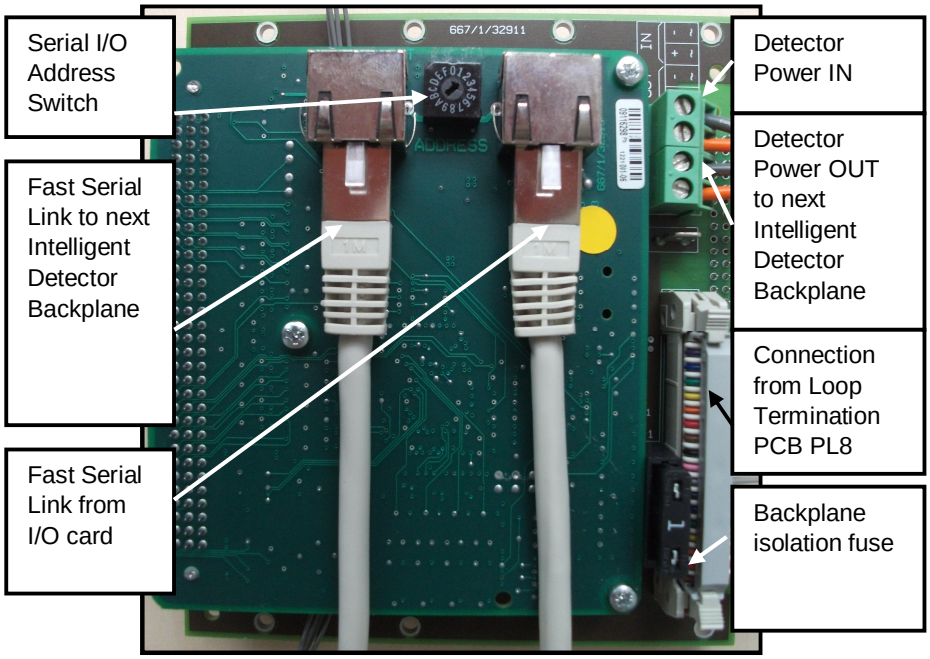
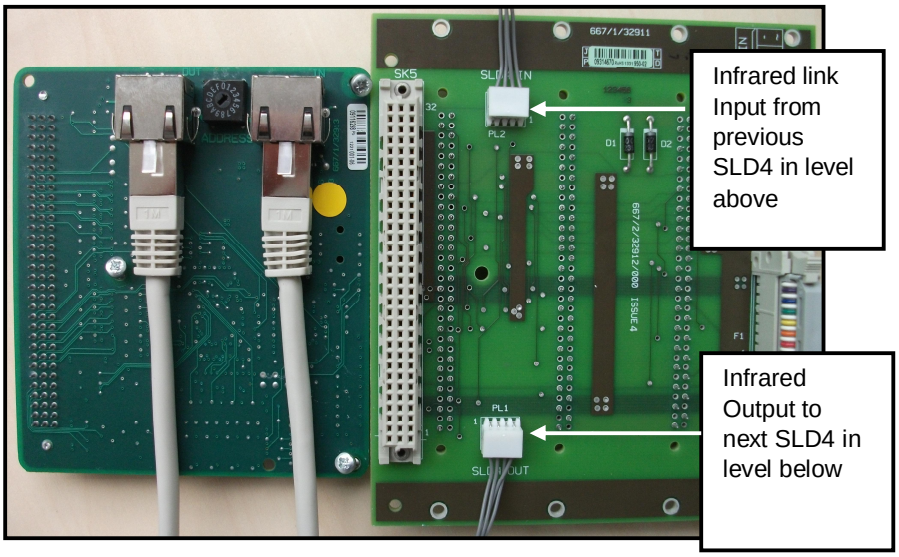
Figure 47 shows the connections of the serial link to the first Intelligent Detector Backplane. Intelligent Detector Backplanes are connected using Cat5e cable. The sequence of connection set out in **Table 5** should be followed. The GSPI serial link is connected from the first Intelligent Detector Backplane OUT socket into the second Intelligent Detector Backplane IN socket. This sequence of connections should be followed for connection between first Intelligent Detector Backplanes and the final Intelligent Detector Backplane. Please also note that a separate infrared connection is required for SLD4 automatic set-up. This link operates horizontally and therefore SLD4 cards must be mounted alongside each other to communicate in this fashion. Please refer to **Figure 47** which shows the required connection to continue this link vertically.

Figure 47 – IDB Serial Connection


Serial I/O Address Switch
Fast Serial Link to next Intelligent Detector Backplane
Fast Serial Link from I/O card
Detector Power IN
Detector Power OUT to next Intelligent Detector Backplane
Connection from Loop Termination PCB PL8
Backplane isolation fuse
667/1/32911
IN
ADDRESS

View Intelligent Detector Backplane with comms PCB removed



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4.8 Single Detector Backplane

Single Detector Backplane do not form part of the Outercase, chosen form **Table 4**, and therefore should be specified separately; if they be preferred over Intelligent Detector Backplanes. The optimisation of the Single Detector Backplane follows the same sequence of positioning as that detailed in section 4.7 The Single Detector Backplanes occupy the position shown for Intelligent Detector Backplane. Power for the Single Detector Backplanes is obtained from detector power kit, as detailed in paragraph 4.12. Please refer to **Figure 48** and 48 for the Single Detector Backplane connection scheme.

Figure 48 – Single Detector Backplane

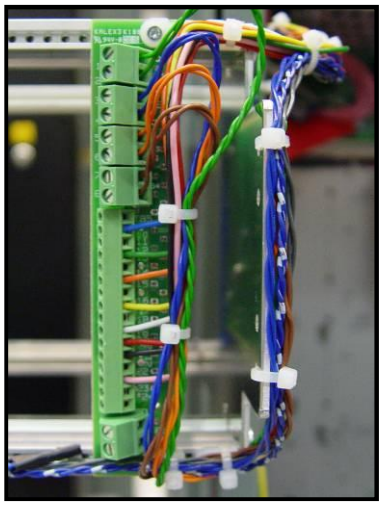
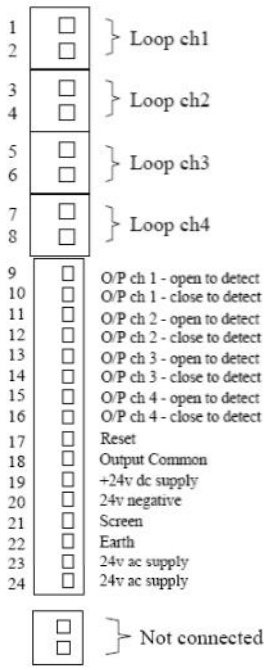


Figure 49 – Single Detector Backplane connections



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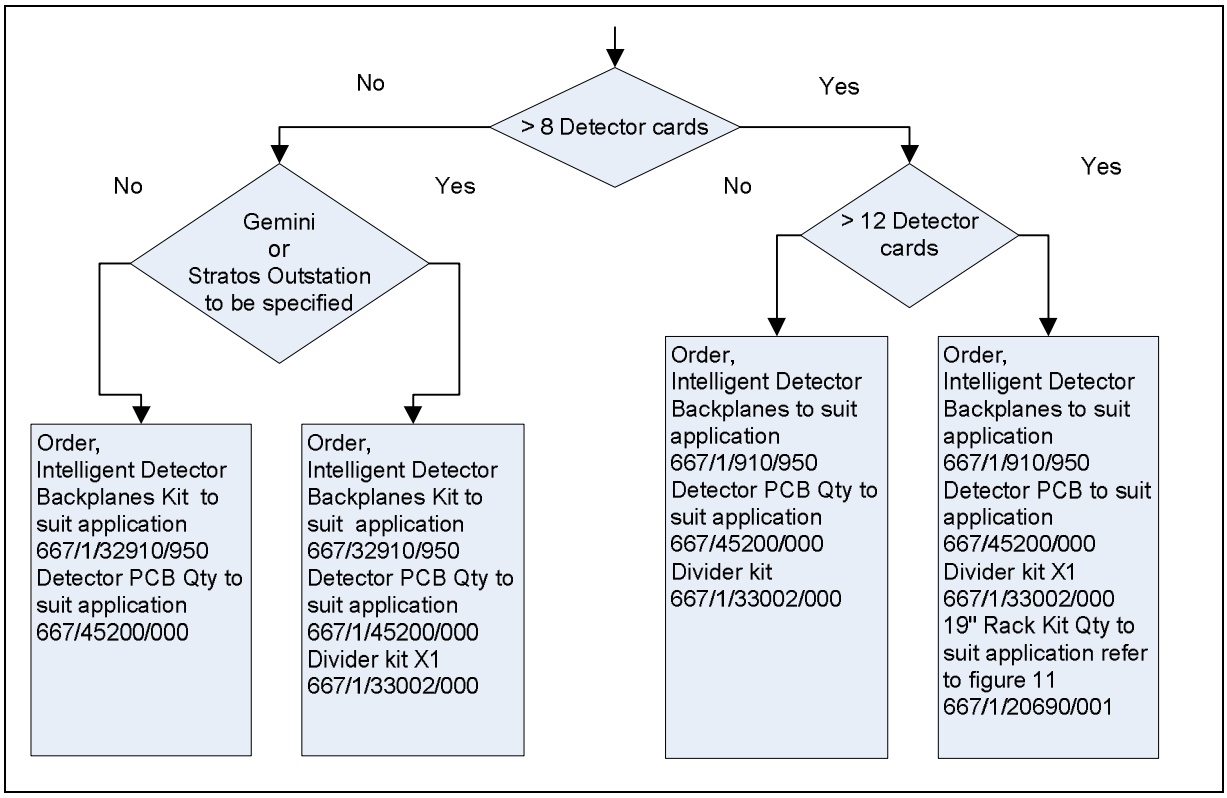
4.9 SLD4 Detector Cards

SLD4 Detector Cards do not form part of the Outer case, chosen from **Table 4** and therefore must be ordered separately. As detailed previous sections, detector cards are inserted into Intelligent Detector Backplanes. Each Intelligent Detector Backplane will accommodate four SDL4 Detector Cards. The SDL4 Detector Cards have a facility to communicate with each other to allow automatic setup. This communication facility uses an infrared link. The infrared beam travels horizontally between SLD4 cards and therefore only those SLD4 cards that are mounted alongside each other can utilise this infrared communications technique. Communications between SLD4 Cards mounted vertically, with respect each out, must be connected using linking cables. Please refer to **Figure 47** which shows the required connection.

Figure 50 – IDB Optimisation


> 8 Detector cards
No
Yes
Gemini or Stratos Outstation to be specified
No
Yes
> 12 Detector cards
No
Yes
Order, Intelligent Detector Backplanes Kit to suit application 667/1/32910/950 Detector PCB Qty to suit application 667/45200/000
Order, Intelligent Detector Backplanes Kit to suit application 667/32910/950 Detector PCB Qty to suit application 667/1/45200/000 Divider kit X1 667/1/33002/000
Order, Intelligent Detector Backplanes to suit application 667/1/910/950 Detector PCB Qty to suit application 667/45200/000 Divider kit 667/1/33002/000
Order, Intelligent Detector Backplanes to suit application 667/1/910/950 Detector PCB to suit application 667/45200/000 Divider kit X1 667/1/33002/000 19" Rack Kit Qty to suit application refer to figure 11 667/1/20690/001

Important Note

Configuration Engineers should read the notes in the WiMag section regarding Backplane positioning. Important information on the relationship between SDL4 Cards, the Infrared communication technique between SLD4 cards and the restrictions this communication technique has on the positioning of Detector Cards is contained in the that section.

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4.10 Loop Termination Cards

The following section defines the order of allocation for the detector loop termination Cards starting at the bottom left of panel No. 2. These boards are directly connected to the Intelligent Detector Backplanes via a twisted pair ribbon cable Please note the Loop termination PCB is part of the intelligent Detector Backplane Kit and therefore it is not required to order this item separately.

Figure 51 – Loop Termination Card Optimisation

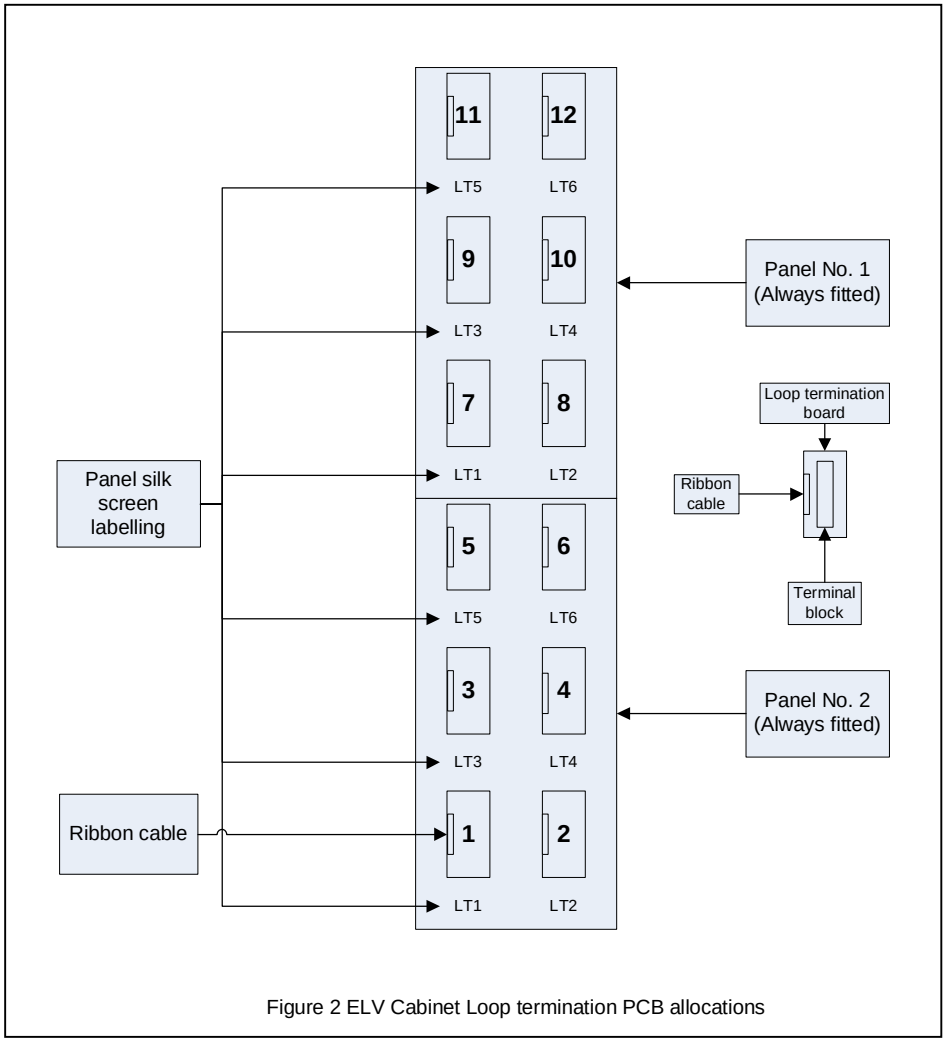

Figure 2 ELV Cabinet Loop termination PCB allocations

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Notes/Rules:

Panels 1 and 2 are always fitted
Loop Termination PCBs MUST be in the same cabinet as the Detector cards and intelligent backplanes connected to them i.e. it is NOT permissible to take the twisted ribbon cable joining the backplane to Loop Termination PCBs from one cabinet to another
PCB positions are silk screened LT1 etc
Loop Termination Board 1 allocated to Panel 2, position LT1
Loop Termination Board 2 allocated to Panel 2, position LT2
Loop Termination PCB 3 allocated to Panel 2, position LT3
Loop Termination PCB 4 allocated to Panel 2, position LT4
Loop Termination PCB 5 allocated to Panel 2, position LT5
Loop Termination PCB 6 allocated to Panel 2, position LT6
Loop Termination PCB 7 allocated to Panel 1, position LT1
Loop Termination PCB 8 allocated to Panel 1, position LT2
Loop Termination PCB 9 allocated to Panel 1, position LT3
Loop Termination PCB 10 allocated to Panel 1, position LT4
Loop Termination PCB 11 allocated to Panel 1, position LT5
Loop Termination PCB 12 allocated to Panel 1, position LT6

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4.11 WiMag

4.11.1 WiMag 3U Rack Kit (19”) System

WiMag is not included in the Outercase ordered from **Table 4** and therefore must be specified separately. Please refer to the parts listing. The following configuration procedure details a basic controller WiMag installation. Full system installation details should be sought from the WiMag Detection System General Handbook

With reference to **Figure 52**, the cabinet mounted equipment required as part of the WiMag installation is mounted to the 19” WiMag Communications Rack Assembly. This unit will be installed below the 6U Rack Unit, housing the main controller function Cards. The WiMag Communications Rack Assembly will hold up to three standard Interface Cards, servicing 20 WiMag sensors each. Each of the standard interface cards plugs into an individual backplane card. Sufficient space is available behind the centre section of the WiMag Communications Rack Assembly to house the necessary 4/8 port Power Over Ethernet (POE) Switch. A Power Supply Unit will be installed on the right hand side of the WiMag Communications Rack Assembly. The standard WiMag Communications Rack Assembly is supplied with one standard interface Card, and associated backplane. Additional Standard Interface Cards should be ordered at controller configuration time. The appropriate POE unit should also be ordered at controller configuration time.

Figure 52 - WiMag

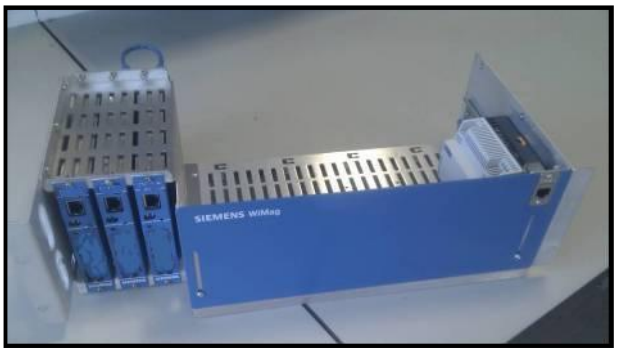
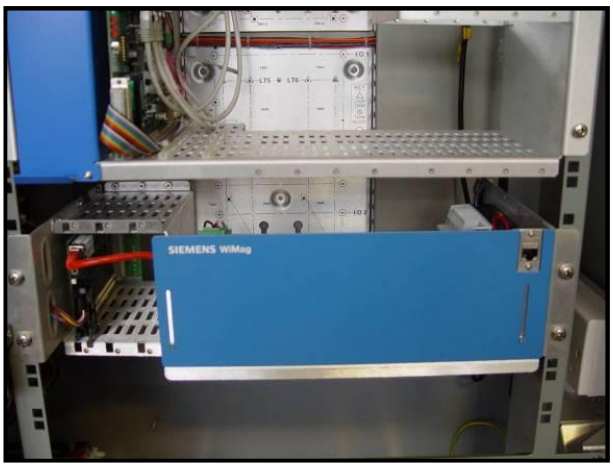


Figure 53 - WiMag



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The selected POE device should be installed prior to the installation of the WiMag Communication Rack being installed in the controller. The POE is secured into the WiMag Communications Rack on the DIN rail, as illustrated in **Figure 54**, 54 and 55.

Figure 54 – POE Unit

Connect a non-POE Ethernet port to the user maintenance Ethernet port using a supplied Ethernet cable.

Figure 55 – POE Unit

Figure 56 – POE Unit

48V DC Power is provided to the Power Over Ethernet switch from the WiMag Communications Rack Power Supply. The Grey wire from the PSU will be connect to the +VE terminal and the white return wire will be connected to the –VE terminal of the POE switch.

Figure 57 – POE Unit

The backplane is used to provide power to the interface card. Backplanes are connected together using Ethernet cable. The first Backplane is connected to the PHS (PL2 or PL4) PCB at the controller's Processor Card. On those occasions when the Ethernet ports on the

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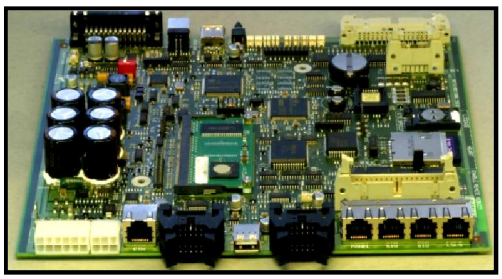
PHS PCB are occupied an output port on an Intelligent Detector Backplane will be utilised. Please refer to **Figure 58** and 58.

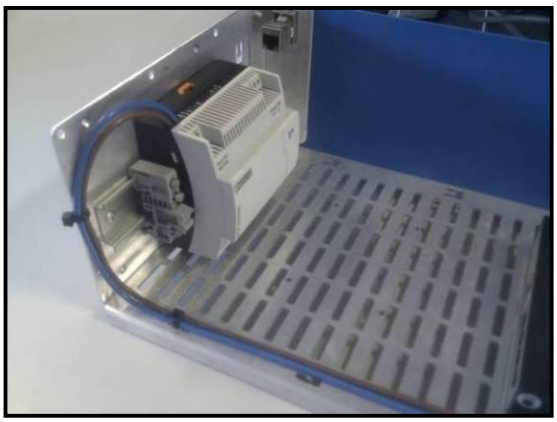
Figure 58 – WiMag Backplane

Figure 59 – CPU Card



The Standard Interface Cards are connected from the front Ethernet port to the appropriate ports on the POE switch.
The WiMag Communications Rack Assembly will be provided with unfiltered mains from the controller Master Switch Unit. Live is to be taken from the 6amp auxiliary miniature circuit breaker, marked as 'AUX1 MCB', Neutral from the neutral block and Earth from any main earthing stud.

Figure 60 – WiMag Tray



61 – Master Switch Unit

The instructions above details the basis configuration procedure for the WiMag system into a ST900 ELV Controller The final configuration and commissioning of the Standard Interface outputs and the interface with street installed equipment should be sought from the WiMag Detection System General Handbook.

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4.11.2 WiMag Loop Detector Replacement Card

Under normal circumstances WiMag Detection signals will be processes by components in the WiMag system, detailed in section 4.11.1.
However, to allow the minimum amount of equipment to be installed in a controller the WiMag loop detector replacement card has been developed to provide up to 4 magnetometers.
The WiMag Loop Detector Replacement Card plugs into either an individual detector backplane or an intelligent Detector Backplane. Configuration Engineers should configure controllers to ensure that the WiMag Loop Detector Replacement Cards are inserted into their own Intelligent Detector Backplane or Single Detector Backplane. This is because the WiMag Loop Detector Replacement Card has particular power requirement that are not compatible with the SLD4 Detector Cards. Additionally, WiMag Loop Detector Replacement Cards should not be mounted between SLD4 Cards as this would interrupt the infrared communications link between SLD4 Cards; referred to in the sections detailing Intelligent Detector Backplanes and SLD4 Cards.

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4.12 Detector Power and Ancillary Power

4.12.1 HPU Power for Detectors

The -24v DC detector power supply should be obtained from the 12 way terminal block on the side panel next to the HPU. This terminal block is marked as DET COM (+) (Orange wire) and DET SUP (-) (Grey wire) and the power is supplied to these terminals from the 2.8 amps DC RMS supply from 1st HPU Socket SK2 terminals DET COM (+) and DET SUP (-) and if fitted a further 2.8 amps DC RMS from 2nd HPU (667/1/33040/001). Connect the Orange wire to terminals DET COM (+) and the Grey wire to DET SUP (-). Then connect the Orange wire to SK7 IN + and the Grey wire to SK7 IN – on the Intelligent detector

Figure 62 – HPU Detector Power

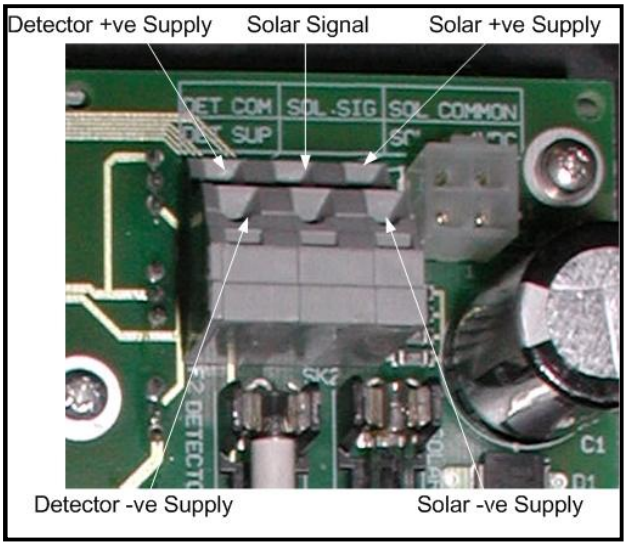
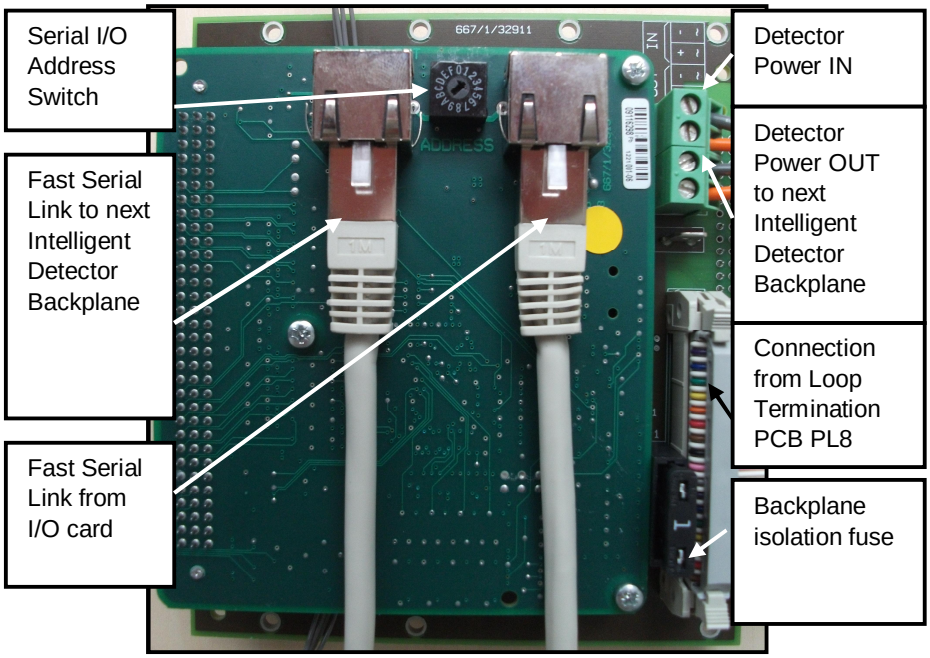


Figure 63 – Detector Power


Serial I/O Address Switch
Fast Serial Link to next Intelligent Detector Backplane
Fast Serial Link from I/O card
667/1/32911
ADDRESS
IN
Detector Power IN
Detector Power OUT to next Intelligent Detector Backplane
Connection from Loop Termination PCB PL8
Backplane isolation fuse

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4.12.2 Two Amp Ancillary Power Supply

On those occasions when additional -24 AC power is required, and a second HPU has not been specified, an additional 2 Amp DC RMS power supply can be provided. This should be positioned above the HPU on the left hand panel. Additional information on this exact position may be sought from drawing 667/GA/33075/ETC.

With reference to the **Figure 64**, 64 and 65 the AC input for the ancillary power supply should be obtained from the MCB on the master switch unit (Live connected to MCB SW1, Neutral connected to Terminal N3). The step down transformer will be supplied with conventional power supply leads, to allow this connection.

The AC output from the transformer is rectified and applied to a terminal block, as detailed in the figues below. Orange coloured wire will be used to connect the DET COM + output from the rectifier to the terminal block. Slate wire will be used to connect DET SUP -24V from the rectifier to the terminal block. Please refer to 667/GA/33075/ETC for a detailed connection scheme and earth arrangement.

Please Note! 2 Amp power supplies contain both transformer and associated rectifier. When specifying multiple power supplies care should be taken to ensure that there is sufficient space within the specified cabinet for the required items.

Please note! If it is anticipated that multiple 2 Amp power supplies will be required, to service the configured load, AC input for the additional powers supplies should be provided by configuring the ST950ELV controller with additional MCB.

Figure 64 – Detector Power

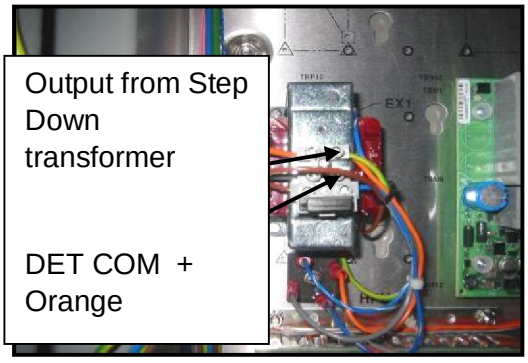


Figure 65 –Detector Power

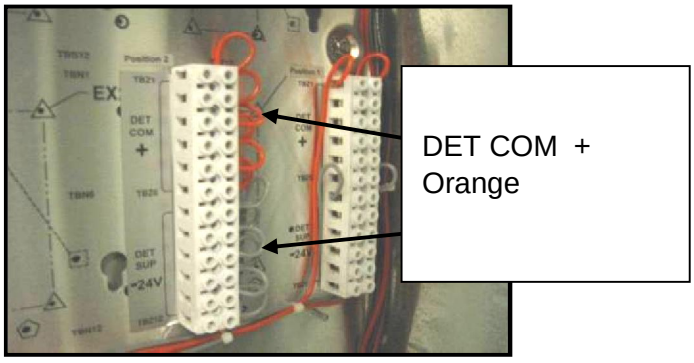
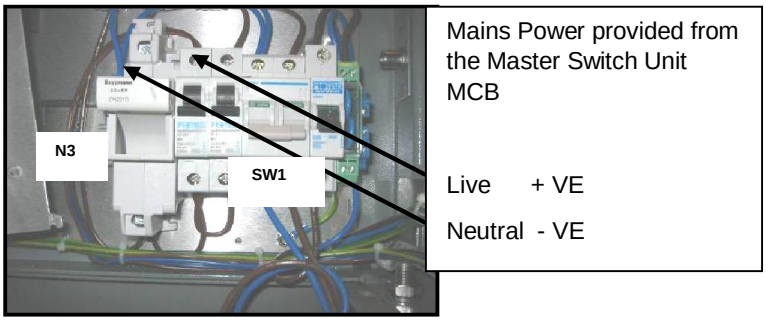


Figure 66 – Detector Power



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4.12.3 Six Amp Ancillary Power Supply

On those occasions when additional -24 AC power is required, and a second HPU has not been specified, an additional 6 Amp DC RMS power supplies can be provided. This should be positioned above the HPU on the left hand panel. Additional information on this exact position may be sought from drawing 667/GA/33074/ETC.

With reference to the Figure 67, 67 and 68, the AC input for the ancillary power supply should be obtained from the MCB Supply on the master switch unit (Live connected to MCB SW1 and Neutral connected to Terminal N3). The step down transformer will be supplied with conventional power supply leads to allow this connection.

The AC output from the transformer is rectified and applied to a terminal block, as detailed in the figure below. Orange wire will be used to connect the DET COM + output from the rectifier to the terminal block. Slate coloured wire will be used to connect DET SUP – 24V from the rectifier to the terminal block. Please refer to 667/GA/33074/ETC for a detailed connection scheme and earth arrangement.

Please Note! 6 amp power supplies contain both transformer and associated rectifier. When specifying multiple power supplies care should be taken to ensure that there is sufficient space within the specified cabinet for the required items.

Please note! If it is anticipated that multiple 6 Amp power supplies will be required, to service the configured load, AC input for the additional powers supplies should be provided by configuring the ST900ELV controller with additional MCB.

Figure 67 – Detector Power

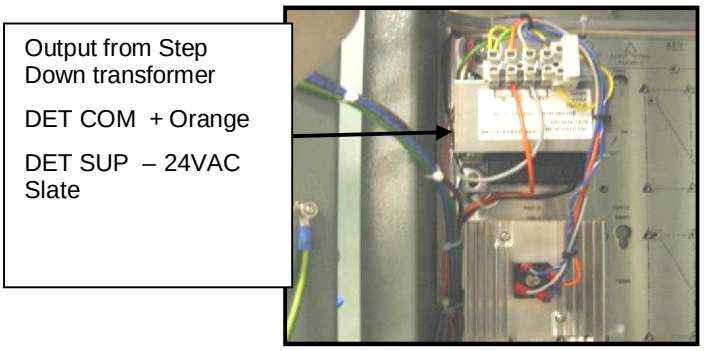


Figure 68 – Detector Power

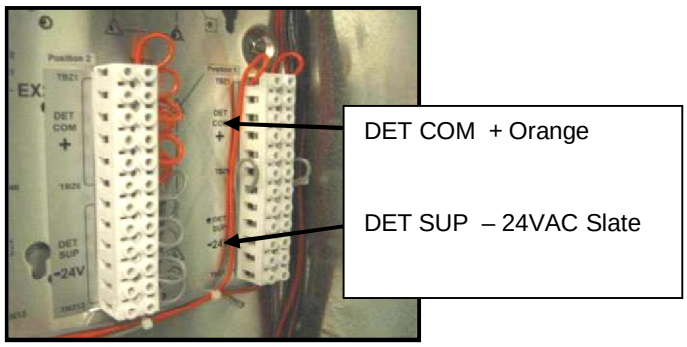
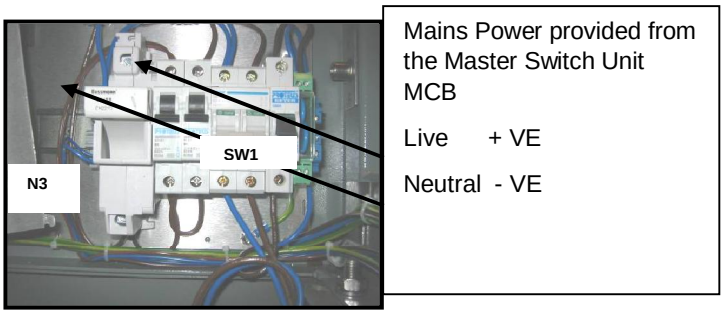


Figure 69 – Detector Power



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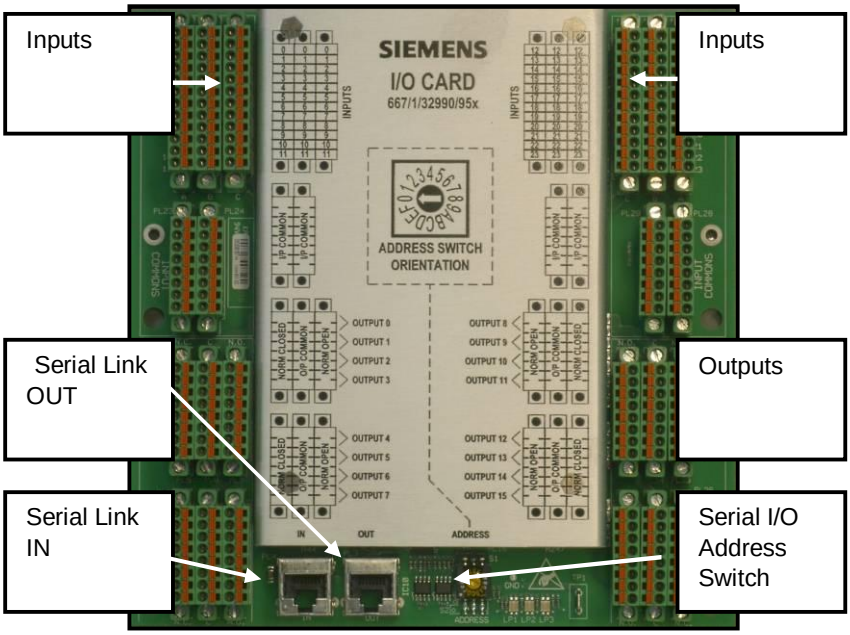
4.13 Serial I/O Cards

The Serial Input/Output (I/O) Kits do not form part of the Outercase selected from **Table 4** and therefore should be ordered separately. Two types of I/O cards, remote from the CPU Card, are available one with 4 outputs/16 inputs and one with 16 outputs/16 inputs. Four I/O cards can be configured to the ST950. **Figure 37** sets out stencil indications on the Terminal Panel to aid positioning optimisation.

Figure 70 – Serial I/O Card



The I/O cards communicate with the CPU card via the RJ45 Cat5e, as a serial link. The serial link communication protocol relies on addressing techniques to ensure the appropriate information is delivered to the intended component. This means that the order in which the components are connected to the fast serial link is not imperative to successful communications. However, to maintain consistency of build sequence of connections set out in **Table 5** should be used.

As stated above, once connected into the serial link the CPU card indentifies the I/O by the appropriate address. The address is set on the I/O card, shown **Figure 70**. Controller special instructions will provide details on assigned inputs and outputs.

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Figure 71 illustrate the available positions available when allocating space to I/O card.

Figure 71 – I/O Serial Card Optimisation

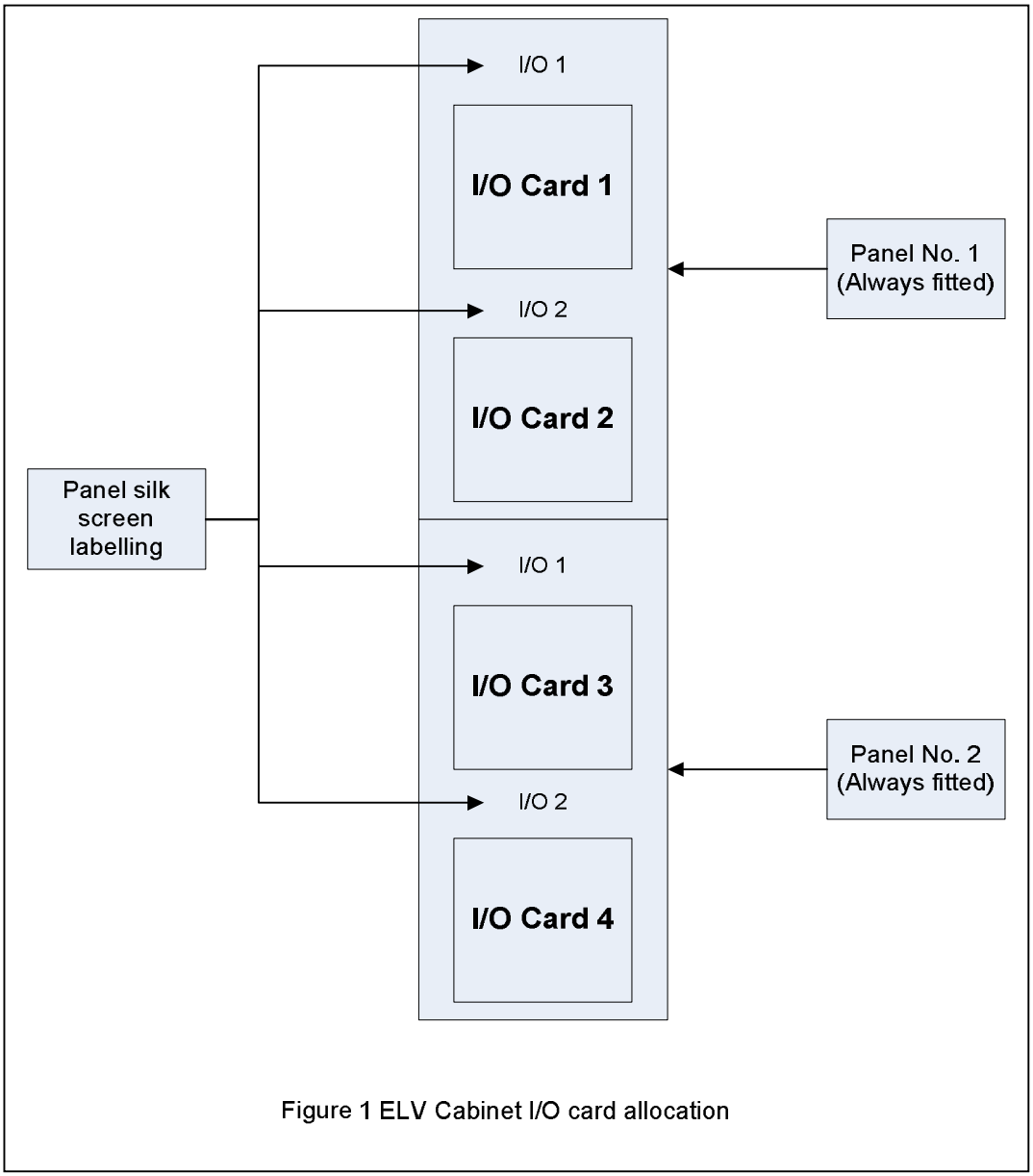

Figure 1 ELV Cabinet I/O card allocation

Notes/Rules:
Panels 1 and 2 are always fitted
Card positions are silk screened I/O 1 etc
I/O Card 1 allocated to Panel 1, position I/O 1
I/O Card 2 allocated to Panel 1, position I/O 2
I/O Card 3 allocated to Panel 2, position I/O 1
I/O Card 4 allocated to Panel 2, position I/O 2

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4.14 Gemini^2

This unit is not included in the Outercase ordered from **Table 4** and therefore must be specified separately. Please refer to the family tree document for the Gemini unit (667/1/32600/ETC) when specifying the make-up of the Gemini unit. Paragraph 4.7 explains the location the Gemini unit can take within the ST950ELV cabinet. The Gemini unit communicates with the ST950ELV CPU Card through a serial interface. To establish this interface connect MCE0141 (667/1/26579/000) to PL4 on Gemini to the RS232 port 25 way D on ST900ELV CPU. Power for the Gemini unit can be provided by utilising one of the mini circuit breakers within the Master Switch Assembly. One mini circuit breaker will be installed for the OTU (Gemini); however, a second and third kit may be fitted using kit of parts 667/1/27121/000. Positions for these additional power facilities are shown on 667/GA/27121/000.

Note: These two additional kits can only be fitted if the 300mA RCD unit is not required.

To provide Lamp Supply monitoring on the Gemini the 'High V' Input 2 can be utilised. An electro-mechanical relay switched from an I/O card output (via Special Conditioning) provides the lamp supply loss indication into the Gemini unit. Full installation details can be obtained from drawing 667/GA/32612/000.

If wired at the factory, the wires for connection to an I/O card output will be brought within reach of the I/O card outputs but left unconnected. The correct output will need to be identified for each installation, and the wires connected to the output N.O. (violet wire) and output COM (grey wire). Consult the configuration's Special Instructions for details of how to activate the Special Conditioning code to drive the 'supply monitor' relay.

Figure 72 – Gemini Connections

Warning! *It is important that the Gemini Last Gasp Dial Battery, within the Gemini Power Supply Unit, is orientated correctly; the battery terminal must be facing up. If the unit is to be mounted in such a way that the battery terminals are not facing up then it is necessary to implement certain modifications to ensure that the battery is not operating upside down. Please refer to document 667/HB/32600/000 for the necessary modifications.*

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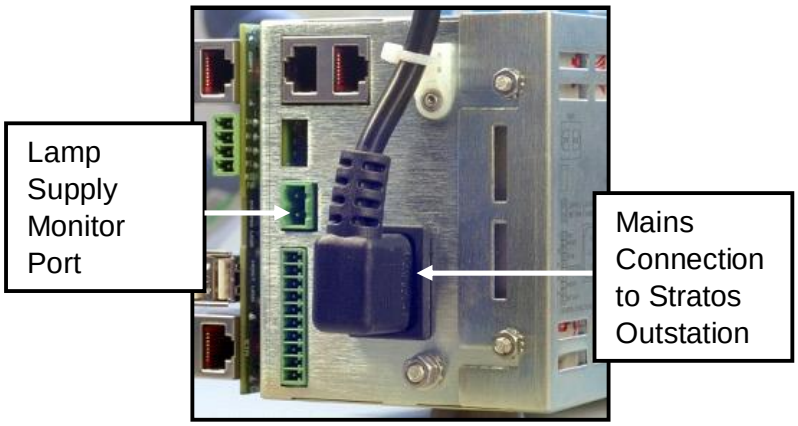
4.15 Stratos Outstation

This unit is not included in the Outercase ordered from **Table 4** and therefore must be specified separately. Please refer to the family tree document for the Stratos Outstation (667/DZ/52250/ETC) when specifying the make-up of the unit. Section 4.7 explains the location the Stratos Outstation unit can take within the ST950ELV cabinet.

Power for the Stratos Outstation can be provided by utilising one of the mini circuit breakers within the Master Switch Assembly. One mini circuit breaker will be installed for the OTU (Stratos Outstation); however, a second and third kit may be fitted using kit of parts 667/1/27121/000. Positions for these additional power facilities are shown on 667/GA/27121/000. With reference to **Figure 73,** mains supply power for the Stratos Outstation is connected via a standard IEC C13 mains lead. The other boards in the system are powered over the RJ45 GSPI cables. To provide Lamp Supply monitoring on the Stratos Outstation the Lamp Supply Monitor Port is used.

Figure 73 - Power for Stratos Outstation Unit



If the internal backup battery is fitted the Stratos Outstation can be mounted in any orientation apart from front panel facing down.

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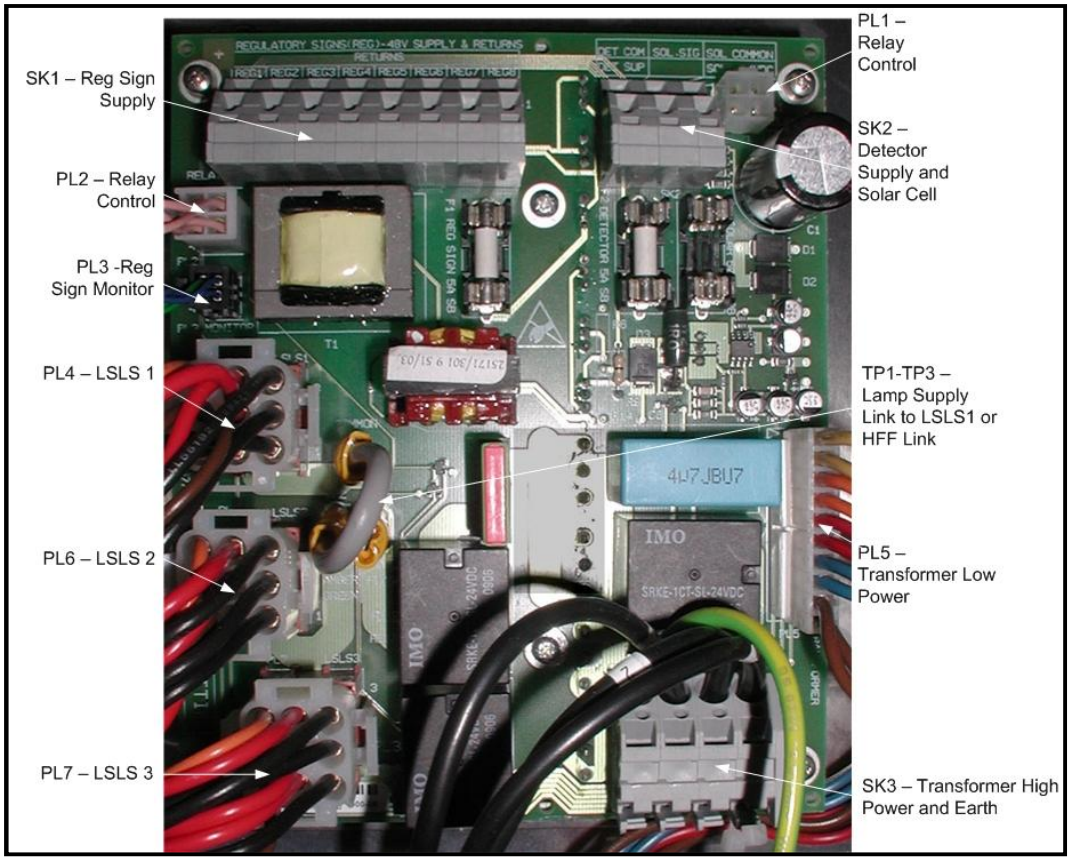
4.16 Regulatory Sign Connection

4.16.1 HPU Regulatory Sign Connection

A maximum of 8 regulatory signs can be run from the 1st HPU Socket and these are connected to SK1 terminals 9 to 16 labelled Reg1 to Reg 8 with the returns also on socket SK1 terminals 1 to 8 labelled Returns. **A further 8 regulatory signs** can be supplied from the 2nd HPU.

Figure 74 – HPU Connections


SK1 – Reg Sign Supply
PL2 – Relay Control
PL3 -Reg Sign Monitor
PL4 – LSLS 1
PL6 – LSLS 2
PL7 – LSLS 3
PL1 – Relay Control
SK2 – Detector Supply and Solar Cell
TP1-TP3 – Lamp Supply Link to LSLS1 or HFF Link
PL5 – Transformer Low Power
SK3 – Transformer High Power and Earth

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4.16.2 Additional Regulatory Sign Connection

If the 2nd HPU PCB is not specified and there is a requirement to power more than 8 regulatory signs an expansion kit (667/1/33070/000) is available to support an additional 12 regulatory signs.

With reference to **Figure 76** and 77, the expansion kit is positioned above the HPU on the left hand side of the cabinet. Additional information on the exact position can be sought from diagram 667/GA/33070/000 Sheet 1. **Please Note! The Additional Regulatory Sign Kit contains both transformer and associated PCB. When specifying multiple kits care should be taken to ensure that there is sufficient space within the specified cabinet for the required items.**

With reference to **Figure 75**, the AC input for the ancillary power supply should be obtained from the master switch unit (Live connected to MCB SW1 and Neutral connected to Terminal N3). The step down transformer will be configured with conventional power supply leads to allow this connection. The AC output from the transformer is applied to a terminal strip TB2, as detailed in the figure below. Please refer to 667/GA/33070/000 Sheet 2 for a detailed connection scheme and earth arrangement.

Figure 75 – Additional Reg Sign Power

Figure 76 – Additional Reg Sign

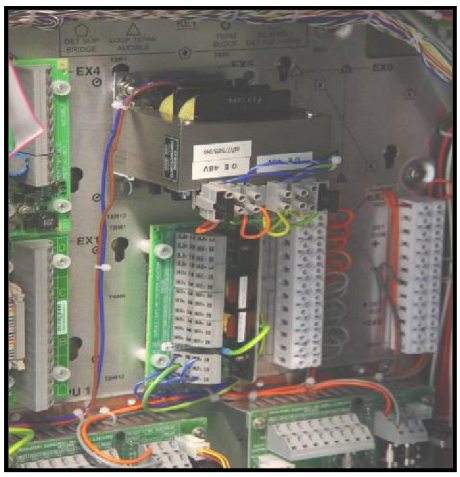
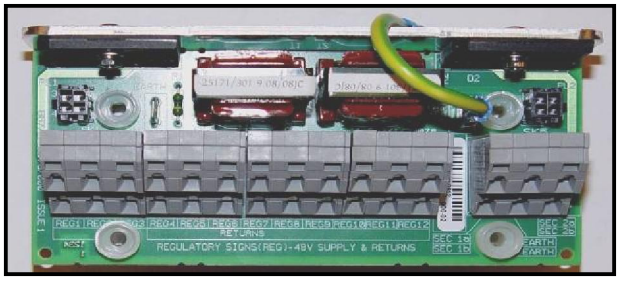


Figure 77 – Additional Reg Sign



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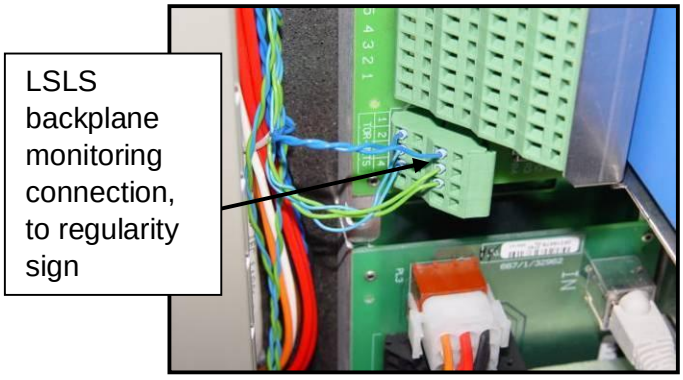
Lamp monitoring is performed (if required) by LSLS backplane external monitor input channels. PL1 and PL2 on the Additional Regulatory Sign Kit PCB are four way Molex style connectors. These current outputs are wired to the LSLS backplane module external (torroid) inputs, using two twisted pair and provide monitoring signals, if required.

An indication of the connections point is provided in the **Figure 78** immediately below. The full connection scheme should be sought from drawing 667/GA33070/000 sheet 2

Figure 78 – LSLS Monitoring Connections



Please Note Instructions and specific precautions for making the LSLS backplane torroid connections are detailed the Siemens Type 900 ELV Installation Commissioning and Maintenance Handbook, 667/HE/32900/000, Paragraph 4.19. Output terminals are configured using the appropriate software configuration tools (IC4). Please refer to paragraph 6.15 for information on HPU regularity sign monitoring.

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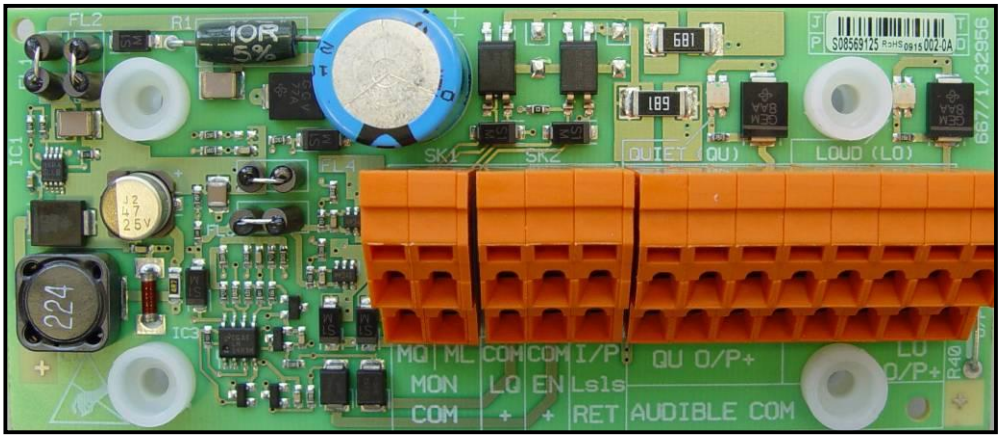
4.17 Audible Supply Kit

To provide drive for audible indicators an Audible Driver Kit of parts can be ordered. The audible driver is not contained within the Outercase chosen form **Table 4** and therefore should be ordered separately. Please consult the parts listing. With Reference to **Figure 79**, the module is powered from the green phase of the relevant pedestrian phase output of the LSLS card. A 12V DC output drives the appropriate audible unit. The module can be connected to an I/O card to allow operation to be inhibited and to allow switching between Loud and Quiet sound levels.

Output connection for the Audible units can be taken from the appropriate Loud/Quiet connections, indicated in **Figure 79**. The appropriate Power Present (PP) LED on the module illuminates when the Loud/Quite audible is being driven. Each Audible Driver Module can drive up to 8 audible units. It is recommended that all audible units connected to an Audible Driver Module are the same type. If there is a requirement to switch between loud and quite a minor modification to the Audible Driver Module is necessary. Full detail of these additional requirements should be sought from the ST950ELV General Handbook.

Figure 79 - Audible Supply Kit



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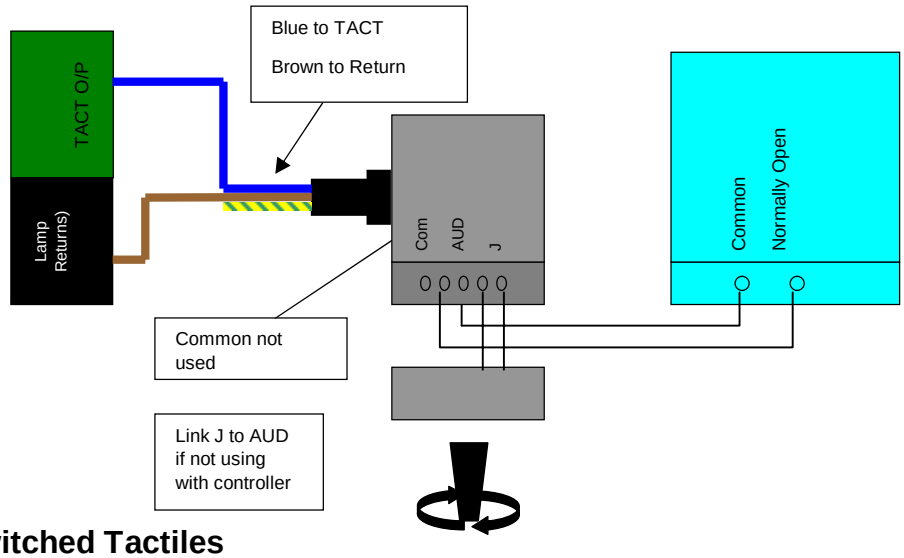
4.18 Tactile Unit

4.18.1 None Switched Tactiles

Non Switched tactiles are driven from the green man output of the appropriate pedestrian phase and rotate whenever the pedestrian green is illuminated. **Figure 80** illustrates the necessary connections for non-switched tactiles. Refer to part listing.

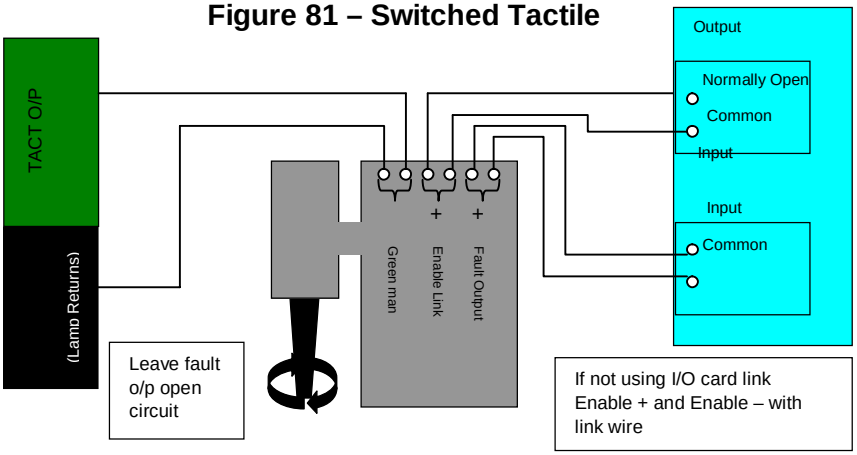
Figure 80 – Non Switch Tactile



4.18.2 Switched Tactiles

Switched tactiles are also driven from the green man output of the appropriate pedestrian phase but can be activated when required by the I/O output. There are several mounting options for the tactile controller module. When using tactiles, with integrated motor and drive module, the assembly can be mounted in the pedestrian indicator. When using tactiles with separate motor and drive module, the drive module can be mounted inside the nearest Helios signal head (the recommended position for mounting the tactile controller is at the top of the Amber aspect case – see Helios General Handbook 667/HB/30000/000). The drive module can be mounted inside the traffic controller cabinet. Please refer to the ST950ELV Handbook when installing tactiles in parallel. Separate returns must be used between I/O card and tactiles.

Figure 81 – Switched Tactile



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4.19 Solar Cell Kit of Parts

With reference to **Figure 74** the -24 power supply and activation signal are provided by the HPU PCB, at SKT 2.

4.20 ST950ELV Parts Listing

Table 7

Part Number	Description
667/1/45950/020	ST950 ELV Cabinet UK 20A Single LSLS - Grey
667/1/45950/040	ST950 ELV Cabinet UK 40A Single LSLS - Grey
667/1/45950/021	ST950 ELV Cabinet UK 20A Single LSLS - Black
667/1/45950/041	ST950 ELV Cabinet UK 40A Single LSLS - Black
667/1/32900/000	Expansion cabinet kit - Grey
667/1/32900/001	Expansion cabinet kit - Black
667/1/46085/002	ST950 I/O card kit (4 outputs) - not included in controller build
667/1/46085/001	ST950 I/O card kit (16 outputs) - not included in controller build
667/1/46014/000	ST950 CPU I/O kit (4 outputs) - not included in controller / rack build
667/1/45952/001	ST950 CPU I/O kit (4 outputs) cableform
667/1/32943/001	ELV Lamp switch (LSLS) kit
667/1/32960/001	ELV Lamp switch (LSLS) backplane kit
667/1/32945/000	ST950 ELV rack LSLS wiring kit
667/1/32943/001	ELV Lamp switch (LSLS) kit
667/1/32960/001	ELV Lamp switch (LSLS) backplane kit
667/1/32945/000	ST950 ELV rack LSLS wiring kit
667/1/45952/001	ST950 CPU I/O kit (4 outputs) cableform
667/1/33002/000	ELV detector 6U rack expansion kit
667/1/33075/000	ELV 24 V detector supply Kit (2A)
667/1/33074/000	ELV 24 V detector supply Kit (6A)
667/1/33070/000	ELV Regulatory Sign expansion kit
667/1/32955/000	ELV Audible / Tactile supply kit
667/1/33007/000	ELV LSLS expansion kit (for second cabinet)
667/1/32994/001	Backplane SLD4 Link Cable (short)
667/1/32994/002	Backplane SLD4 Link Cable (long)

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Part Number	Description
667/1/33080/000	ST950 ELV Mains connection kit
667/1/27056/001	Manual Panel Full Kit
667/1/27104/000	DFM lens kit
667/1/47210/100	WiMag standard interface card kit
408/4/54224/000	4 Port POE Switch
408/4/54225/000	8 Port POE Switch
667/1/47280/000	WiMag loop detector replacement card

5 CONTACT WITH TECHNICAL SUPPORT

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